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ELECTRICAL CONTRACTING AND ELECTRICAL CONSTRUCTION.

One sometimes hears the assertion that a majority of the electrical contractors in the country are really not contractors at all, but that they are nothing more than electricians who, from practical experience, happen to know how to do electrical wiring.

It has been frequently contended, too, that many of the contractors of this class are content to go on installing electrical work without giving much thought to the matter of whether their work is proving profitable to them or not. Wire pullers and pipe benders, such contractors have been called.

People who have given conditions now rather general in the contracting field any considerable attention are bound to admit that such criticisms as the foregoing are not wholly without foundation. It is a fact that electrical contractors as a class are much more skilled in electrical construction than in electrical contracting. The first is a trade, and the second a business; and as a rule contractors are better craftsmen than business men. But this lack of business training has been due to lack of opportunity to acquire it rather than to any lack of desire for it. It can also very well be said in this connection that it is not desirable to emphasize the necessity of business training, as much as it is needed, so strongly as to cause the importance of interest in the best methods of electrical construction to be lost sight of. The almost complete absence of the consideration of problems in electrical construction from the discussions at conventions of associations of contractors and from the official publications of such associations would seem to indicate that there was some danger of this now. While there can be no question that many contractors do need business training and need it badly, the contractor's enthusiasm for devising plans for making more money should never be greater than his interest in the promotion of better methods of electrical construction. In fact, his only reasonable claim for patronage must ultimately be based on his ability to give better service than others can give. For example, contentions that wiring jobs should be taken from the central station, say, and given to the contractor just because he is a contractor, are hardly less than silly. If the contractor can do more and better work for a dollar than anybody else, then he has a right every time to insist upon being given the job. In most cases he can do this, and it is pleasing to be able to add that recognition of this fact is be-

coming encouragingly general. If he would have such recognition become still more general and would place his profession where it will be a permanent one, free from the competition of the cheap wireman and all other individuals or concerns that should keep out of the construction field, he must not permit his enthusiasm for good electrical construction to lag. If he is not an electrical specialist himself he must make somebody else who is one an integral part of his business. Apparent lack of interest in electrical construction can easily be taken as tacit admission of the opinion that anybody at all who wants to can do electric wiring. How prevalent this opinion is and how it is hurting the contracting business, few contractors need be told. They can combat this opinion. It cannot be done by talking nothing but prices, however.

MUNICIPAL OWNERSHIP OF PUBLIC UTILITIES.

Every public utility is a natural monopoly and can be operated to the best advantage of the public which it serves without competition. It differs in this respect from the ordinary private business, and, unlike the latter, does not have the stimulus of competition as an active factor in keeping service and rates at levels satisfactory to the consumers. Such conditions have led to widespread demand for public ownership of all public utilities, and more especially for the municipal ownership of municipal utilities.

Where utilities have been operated under private ownership, the ideals of good service and reasonable rates have in many cases been closely followed by enterprising managements, which have realized that only under such conditions can the business of utility corporations be developed to the highest point commensurate with the size and possibilities of the community which is being served. In other cases, however, the owners of monopoly privileges secured under exclusive franchises have regarded their opportunities for immediate financial gain as the only attainment to be desired. The reasonable requirements of the public have in many cases been utterly ignored. In still other cases the management has been endeavoring to properly fulfill its obligations to the community granting it a franchise, but has adopted the attitude that the public was not concerned with its operation to any further extent than that of accepting service and paying bills, and its attitude has, consequently, been generally misunderstood. The two last classes of utility managers are usually responsible for the demand which springs up sporadically in all parts of the country for municipal ownership.

The municipal ownership and operation of electric power plants has consequently been undertaken in a large number of communities in this country with more or less success, usually less. According to the published figures of the Census Office this number amounted in 1907 to 1,252. In some cases these plants have been started because the community is so small that it did not constitute an inviting proposition for private capital and the only way to secure electric service was to have the community build and operate its own plant. In other cases municipal operation has been started in competition with a private company already in the field, due largely to dissatisfaction with rates and service for reasons above pointed out. In a majority of cases disappointment has finally resulted from these ventures. This is not usually due to the fact of municipal ownership, since that in itself presents certain advantages, such as the ability to borrow money on bonds at a low rate of interest. Failure is usually to be attributed to the conditions of operation, which are inevitably tied up with control by political partisans. Such control usually entails frequent change of management, the employment of inefficient labor and all the other disadvantages which are commonly involved in public administration. The lack of financial interest of the management in the success of the operation makes such management less keen in its business operations. The best type of experts are seldom employed, since there is an indisposition to pay the necessary high salaries to the right kind of men, and even then they are hard to secure under the condition of an uncertain tenure in office. On account of this lack the plant is not usually maintained at a point of high engineering efficiency, and improvement in the art is not utilized, but the plant is usually allowed to continue as first installed until natural depreciation reduces it to the inoperative point. One of the worst features of municipal operation is usually the system of bookkeeping, or lack of any system. The failure to set aside a proper allowance for depreciation, to make the proper capital charges against the investment, to include extensions and similar improvements in the capital account, and to properly debit and credit items of service or expense to other branches of the municipal government, all help to make it impossible to tell whether the rates being charged are more or less than sufficient to properly operate and maintain the plant. This question of accounting is perhaps the greatest fault to be found in municipal operation. Lighting furnished for public use is generally not charged up on the books. This corresponds to the practice of the federal Post Office Department in performing service for other branches of the Government free of charge. This results in an annual deficit which often leads to the misstatement that the Post Office Department does not pay for itself, whereas it has been claimed upon good authority that such deficit is more than covered by the expense of service which should be charged to other branches of the Government. Similarly, services performed by other branches of the city government for the electrical department are usually excluded from the accounting. The result is that usually no one knows whether such a department is

paying its way or not, as will at once be plain by reference to the annual report of the average municipality engaged in such a venture.

Until municipalities can separate the management of purely engineering and business operations from the realm of political partisanship, they would do well to avoid as far as possible participation in any unnecessary ventures of this kind. The regulation of private corporations through public-service commissions accomplishes the same purposes which are aimed at in municipal operation, without the attendant disadvantages. The experience in Wisconsin, where municipally operated utilities are under the supervision of the Railroad Commission, is that such plants are as a rule more in need of regulation than the privately owned plants. Until tax payers can put men in office who will look after their business interests as closely as this is done by the managers of private corporations for their stockholders, and operate upon a business basis, it is not to be expected that municipal operation of engineering departments can be as successful as management by private interests. Occasionally there is an exceptional case where such management is to be seen, due to the superintendence of a capable and loyal public servant. Such cases are all too rare and the example is likely to terminate when the particular official in charge relinquishes his authority.

ELECTRIC TRUCK CONQUERS NEW FIELDS.

Every day develops a new opportunity for conquest upon the part of the electric truck. Public-service corporations in many parts of the country are vigorously investigating the possibilities of this mode of transportation not only as a means for increasing their revenue in connection with the charging of storage batteries, but also with a view of performing many varieties of service for themselves.

The most recent conquest of the electric vehicle, which is of especial significance because of the investment involved and the range of operation of equipment, is that of the New York Railways Company, which operates the surface cars in New York City. The order covers an investment of over $100,000, and includes 1,000-pound panel wagons, a 2,000-pound money wagon, five two-ton emergency wagons, fourteen 3.5-ton hand-operated dumping trucks, four 3.5-ton stake body trucks, and two five-ton stake body trucks. In this truck installation practically all the special applications of the modern electric truck will be utilized. The entirely satisfactory service which the electric truck is giving, singly and in fleets, for work which imposes just as severe requirements as can possibly be met with in the work of the public-service corporation, makes it easy of conjecture that the present installation will meet every demand, and it is expected that this most recent conquest will be followed very shortly by a much wider use of the electric truck for similar services.

PROGRESS IN ELECTRIC-TRUCK DESIGN.

Examination of a number of recently built electric trucks confirms the opinion that their present production is in many cases based upon designs of genuine engineering merit and that these types of vehicles have come to remain permanent factors in industrial transportation. The repeat orders of the large express companies, wholesalers and retailing establishments bear convincing testimony as to the success of these equipments, and it is interesting to note the increased attention which the manufacturers are now paying to features of design which have hitherto received but scant consideration in many circles. It is better understood each year now that the possible daily mileage of a truck depends upon a good many other factors than the loading, battery equipment, controller design and stop schedules. Such incidental features as the size of the wheels, the proportion of springs, systems of assembling parts and the amount of side play and vertical thrusts possible, exert a direct influence upon the distance which a truck can go on a given charge of the batteries.

Truck builders are beginning to appreciate the fact that with a limited battery capacity all friction and power which it is possible to eliminate at anything like a reasonable cost should be avoided, and that lost motion in the frame or in the driving mechanism increases the power consumption for any given service and cuts down the mileage correspondingly. Likewise it is now held of importance to conserve the chauffeur's strength and by easier riding qualities and greater convenience of driving to maintain the operator's efficiency at the highest pitch throughout the longest days and trips. The tired driver will not save power by coasting or watch his opportunity to make the largest number of miles on a given battery charge. To this end in a typical first-class design, special care is taken to prevent the swerving of the steering wheels from side to side and to avoid the need of the driver's muscular efforts to hold the steering wheel in place all day long. A recent tendency toward the use of larger wheel diameters causes the truck to roll over ruts and bumps in the roadway without dropping it into hollows and thereby calling for greater battery outputs. Also by the use in representative equipments of thinner leaves of a tougher and more resilient steel than is commonly employed, less bounding and jolting are obtained, with the result that the driving wheels are kept more continuously upon the road, with consequent less slippage and wasted battery power. The provision of lower centers of gravity by hanging the motor below former levels is another useful point tending to economize in battery output, as do proper alinement and fitting of shafting and driving mechanism.

Purchasers of trucks who look for features of this kind will not be disappointed in the models of the best types now available, and it is a cause for satisfaction that engineering considerations are of so much influence in the production of the latest equipment for electric haulage on highways.

Mining Meeting of American Institute of Electrical Engineers at Pittsburgh.

A regular meeting of the American Institute of Electrical Engineers will be held in Pittsburgh, Pa., on Friday and Saturday, April 18 and 19. This meeting will be held under the auspices of the Committee on the Use of Electricity in Mines, of which George R. Wood, consulting engineer of the Berwind White Coal Mining Company, is chairman, and in coöperation with the Pittsburgh Section. Convention headquarters will be established at the Fort Pitt Hotel.

On Friday morning at 10 o'clock an opening address by President Ralph D. Mershon will be presented, after which the following papers will be read: "Purchased Power in Coal Mines," by H. C. Eddy; "Central-Station Power for Mines," by J. S. Jenks; "Safeguarding the Use of Electricity in Mines," by H. H. Clark.

At the afternoon session the following papers will be presented: "Electricity as Applied to Mining," by J. W. Hopwood; "Central-Station Power for Coal Mines," by C. W. Beers; "Alternating-Current Motors for the Economic Operation of Mine Fans," by F. B. Crosby.

On Friday evening, at six o'clock, a Dutch dinner will be held at the Fort Pitt Hotel. At this dinner a few brief exercises will be held, including some short addresses, which will conclude promptly at 8 o'clock, so that the remainder of the evening will be at the disposal of those desiring to make other arrangements.

The final session will be held on Saturday morning at 10 o'clock, with papers on "Characteristics of Substation Loads at the Anthracite Collieries of the Delaware & Lackawanna Railroad Company," by H. M. Warren and A. S. Biesecker, and on "Mining Load for Central Stations," by Wilfred Sykes and Graham Bright.

The Question Box will wind up the meeting. The Question Box is intended to afford a means of communicating topics for discussion by those who do not care to participate in person. Anyone desiring to bring up for discussion any point in connection with the use of electricity in mines is cordially invited to send in his communications to the secretary or place it in the box in person. It is hoped by this means to bring forth a discussion of the various phases of this subject which would probably not be possible if the interested persons were forced to make the suggestions in open debate. The chairman will read the questions and will request various persons present at the meeting, who are the best qualified, to answer them.

Electric Club of Chicago to Entertain N. E. L. A.

Plans for suitably entertaining the National Electric Light Association when it holds its annual convention in Chicago June 2 to 5 were left in the hands of a committee appointed by President Keech at the meeting on March 27, comprising H. E. Niesz, N. F. Obright, G. B. Foster, W. W. Hincher and H. A. Mott.

N. E. L. A. Booth at the Next New York Electrical Show.

Joseph Becker, chairman of the New York Companies Section, National Electric Light Association, recently appointed a committee to make arrangements for a booth at the coming New York Electrical Show to be held at the new Grand Central Palace, Lexington Avenue and Forty-sixth Street, October 15 to 25.

This will afford an excellent opportunity for the distribution of explanatory literature to the employees of central stations and to electrical contractors concerning the advantages of the National Electric Light Association, for it is pretty safe to assume that 95 per cent of the people engaged in the electrical industry in the vicinity of New York attend this show. Special booklets and circulars telling about the work of the Association and of the Section will be given out, and copies of the various publications of the Association will be on hand to add weight to the great publicity advantages ossible at an exhibition of this kind.

The booth will also be a common gathering place for representatives from all the different branches of the membership of the National Electric Light Association.

Philadelphia Jovians Have Theater Party.

On Thursday evening, March 13, the Jovians of Philadelphia held their annual theater party in the Forrest Theater. The bill of the evening was a musical comedy, entitled "The Count of Luxembourg."

Two hundred and ninety loyal, stalwart Jovians, together with their families, were in attendance, and showed by their presence that they were truly in accord with the spirit of *co-operation* and anxious to bind more firmly the ties which band together this great Order of Jovians.

Juno and Jupiter Watts were among the guests of the evening and were entertained by the following: Statesman Bartlett, Mrs. Bartlett and guest, Miss Rosenthal, Mr. and Mrs. Gilbert, Mr. Vaughn, Mr. and Mrs. Devereux, Mr. Maxwell, Mr. and Mrs. Hallstrom, and Mr. Stout.

The above party dined at the Cafe L'Aiglon after the theater. Other guests of the evening journeyed to various hotels.

It was indeed an evening enjoyed by all, and the very atmosphere seemed to breathe the slogan: "All Together, All the Time for Everything Electrical."

Electrical Exports for February.

The Bureau of Foreign and Domestic Commerce, Washington, D. C., has issued its monthly summary of the imports and exports of the United States for February of this year. From these statistics the following facts relative to the electrical exports have been taken.

February totals are within $51,000 of the record established last November and slightly over the figures for January. The healthy state of the electrical export business is shown by the fact that for five months the totals have always been over $2,000,000 and for the eight months of the fiscal year since last July 1 the average monthly total has been over $2,100,000, compared with a little less than $1,600,000 for the corresponding period of the preceding fiscal year. The detailed figures for February are given below:

Articles.	No.	Value.
Dynamos or generators		$180,706
Motors		378,887
Fans	3,307	38,133
Arc lamps	884	16,378
Carbon-filament lamps	43,329	5,747
Metal-filament lamps	99,196	31,099
Telegraph instruments (including wireless apparatus)		14,625
Telephones		95,737
All other		1,458,607
Total, February, 1913		$2,219,369
Total, February, 1912		$1,641,302

Waco Jovians Prepare for Big Rejuvenation.

A committee, composed of Mac Sterett, Harry Hobson, Bob Wakefield, Charles Martin, Percy Lewis and Jack Owens, assisted by Thomas H. Bibber, held a meeting a week or so ago at Waco to begin the preliminaries for a big celebration which it is proposed will be held at Waco on Jovian Day, September 10. It is proposed to call the affair "The Return to Mount Olympus," and have the Texas Jovians assemble at Waco. There will be a rejuvenation if possible, and a speaker of especial prominence will be secured to present a proper address.

Lynn Section Meeting.

Under the auspices of the Lynn Section of the American Institute of Electrical Engineers, A. E. Kennelly gave a lecture in Burdett Hall, March 26, on "Wireless Telegraphy and Telephony."

On April 23, Elihu Thomson is scheduled to lecture before the section on "Modern Astronomy."

Vladimir Karapetoff.

Vladimir Karapetoff, professor of electrical engineering at Cornell University, accompanied by Mrs. Karapetoff, started on March 29 on an extensive lecturing tour in the Southern States. Professor Karapetoff will address students at four southern colleges, namely, Clemson College, South Carolina, on April 2; Georgia School of Technology, Atlanta, Ga., April 4; Alabama Polytechnic Institute, Auburn, Ala., April 7; University of Tennessee, Knoxville, Tenn., April 10. In each of these places he is scheduled for three lectures: A lecture for electrical students on "Electrostatic and Magnetic Circuits," a general address on the "Development of Personality," and a lecture recital on musical expression.

The foregoing is a rather unusual preliminary to a personal sketch. There are two good reasons for its utilization in such fashion. One, because of its timeliness as a feature of important news, and the other as an indication of the versatility of the subject of this sketch.

Professor Karapetoff is a Russian, born in St. Petersburg in 1876. His father was a mechanical engineer and his mother a medical student. He was educated in the common schools of Tiflis and Baku, in Transcaucasia. He graduated from the Imperial Institute of Ways and Communication, St. Petersburg, receiving the degree of Civil Engineer in 1897, and two years later he began his studies in electricity at an engineering school at Darmstadt, Germany. He was instructor in electrical engineering for four years, beginning in 1897, at several colleges in St. Fetersburg, lecuring also to the evening classes of the Imperial Gun Works. Coming to this country, he was made assistant professor of experimental electrical engineering at Cornell University in 1904, and he is now professor of that department. Professor Karapetoff has been a most versatile and prolific contributor to the scientific and popular-scientific press. During his summer-vacation seasons he has participated in a great many industrial and engineering undertakings which have broadened his interest and widened his scope of information with regard to engineering details and practices of every description.

He is a member of the American Institute of Electrical Engineers, the Society for the Promotion of Engineering Education, the American Association for the Advancement of Science and Sigma Xi Fraternity. He is an ardent student as well as a painstaking, and, incidentally, an enterprising instructor. His wholesome and attractive personality wins immediately the affection of his students, and his superior genius in the imparting of information and the elucidating of knotty problems raises him at once to a high pinnacle of esteem in their consciousness. He is a musician of great ability, and is altogether a most interesting and charming person.

Vladimir Karapetoff,
Professor of Electrical Engineering, Cornell University.

Plans for Chicago Rejuvenations.

The Jovian Lunch Club, of Chicago, at its weekly meeting on March 31, voted indefinitely to hold the June rejuvenation at White City, a summer amusement park, where ample accommodations are available for the vast attendance expected. The National Electric Light Association, which meets in Chicago June 2 to 5, has set aside one evening for this affair. The large ball room will be used for the initiation ceremonies and the Casino for a banquet and cabaret show to follow.

A preliminary rejuvenation will be held on April 15 at the Hotel Sherman.

Society for Electrical Development, Incorporated, Offers Prizes for Slogan.

The Society for Electrical Development, Incorporated, is offering a cash prize for a slogan and trademark which will be used in its advertising and other literature in its campaign for increasing the use of current-consuming devices. There will be a prize of $100 for the slogan and $100 for the trademark, or $200 for the best combination of both.

The competition will close May 5, and the prizes will be awarded by the executive committee of the Society for Electrical Development. In the event of the suggestion which is awarded the prize having been submitted by more than one competitor, the prize money will be divided equally between those submitting the same suggestion which wins the prize.

Suggestions should be addressed to "Slogan Contest," Society for Electrical Development, Incorporated, 29 West Thirty-ninth Street, New York City.

The next meeting of the Executive Committee of the Society for Electrical Development will be held the second Tuesday in May.

On March 27, General Manager Wakeman was present as a guest at the Jovian luncheon at Philadelphia, and he explained to the members just what the aims and objects of the Society are and in what manner the Jovian Order and the Society can work together for their mutual benefit.

Exhibits at the Chicago Convention.

The Assignment Committee of the Exhibition Committee of the National Electric Light Association has already assigned about two-thirds of the space to be used for exhibits at the annual convention in Medinah Temple, Chicago, Ill., during the first week in June. It looks now as if additional space would have to be secured to take care of the class D members who usually exhibit. Unusual care has been taken this year in planning the decorations of the booths, so that all exhibitors will have equal opportunity in displaying goods and meeting delegates.

Arrangements have been completed by the Committee for everything necessary for the exhibitor in the way of furniture, rugs, flowers, electric power and other details.

Western Electric Rises to the Emergency.

The Western Electric Company has been doing emergency work for the restoration of telegraph, telephone and electric light service for several days and nights. The first unusual demands for special service came from tornado-stricken Omaha, where the telegraph and telephone lines were seriously interfered with. The company was notified that 8,000 poles, 25,000 cross-arms, 100,000 pins and 32,000 feet of telephone cables ranging in size from 25-pair to 400-pair were immediately needed. On the day the order was placed 20 carloads of poles, 100,000 pounds of copper wire, and all of the cable went forward. The company's stock of 25,000 cross-arms at Minnesota-Transfer was drawn upon, the poles went forward from the yards in Michigan, and the balance of the equipment from the Chicago stock. The next call was for cable for the Chicago district for the Western Union Telegraph Company. This emergency cable was soon in motion and nearly every through passenger train leaving the East for Chicago up to the time traffic was suspended was pressed into service to carry its quota of this cable.

In the meantime the floods began to make themselves felt in Indiana and Ohio, where within a few days not only telegraph and telephone service, but electric light, street-railway and railroad service was completely demoralized. Again came the call for emergency line material. First of all the company's stocks of cable, cross-arms, wire and line-construction material of every description, located in its distributing houses at Cleveland, Pittsburgh, Indianapolis and Cincinnati, were drawn upon, and then the outlying houses were notified to be ready with their assistance, when it was needed. Complete stocks were available at Boston, New York, Philadelphia, Richmond, Atlanta, Kansas City, St. Louis, Minneapolis and Dallas, these houses constituting a chain of reserve depots surrounding the stricken district, while further west were the other distributing centers of the company which might also be called upon to help.

Meanwhile, it was seen at the company's executive headquarters in New York that with all these reserve stocks depleted, they must be immediately replenished. Accordingly telegraphic orders were issued to send east from Washington 50,000 cross-arms, and requisitions were placed upon the company's sources of supply to increase the stock of copper wire available for shipment to over 500,000 pounds and for the drawing of several hundred thousand pounds of copper wire and the furnishing of from five to ten million feet of rubber-covered wire and outside distributing wire.

Following the subsidence of the water it was expected that there would be like demands upon the company for reserve telephone-exchange equipment. The company was ready with men and apparatus to meet this phase of the emergency. The first call on the New York office was on the morning of March 31, when word came to move a force of telephone installers and switchboard material with the greatest possible speed to Marietta, O., where the lower floors of the Bell Telephone Exchange building had been flooded to the ceiling, the terminal and power equipment completely submerged, and telephone service entirely suspended. Before the day was over, tools and material were in transit on taxicabs to the afternoon express for Wheeling. With this mateiral went a number of men and the superintendent of installation. Their numbers were augmented by others from Philadelphia, Pittsburgh and Pennsylvania points, and on noon of April 1 the entire party in motor boats, which had been chartered for the occasion, started down the Ohio River for Marietta, this being the only means of approaching the stricken district. The dispatch with which this particular case was handled is typical of the way in which the Western Electric Company is performing its part in the restoration of the telegraph and telephone service in Ohio and Indiana and other sections of the country. The industry has watched with interest the development of this company's distributing facilities, but not until this combination of storm and flood has its strong organization really been put to the test.

Dayton Lighting Company Makes Swift Rehabilitation.

The flood at Dayton, Ohio, last week put both power houses of the Dayton Lighting Company out of commission, the plants, the entire business section and the best residential district being under water for over forty hours, until last Friday night. On Sunday, March 30, street lighting service in the business section was resumed, and it is expected that during this week the service outside of the flooded district will resume normal conditions.

President and General Manager Frank M. Tait, over whose safety grave fears were felt for a time, was rescued with his family on Monday. He reports the organization in good shape, and his own forces, augmented by 75 experts from Chicago, New York and other places, are rapidly rehabilitating power stations and distributing lines.

Sterilization of Milk.

The use of ultraviolet rays for the sterilization of milk has been the subject of an investigation carried on in the Bureau of Animal Industry, Washington, D. C., by S. Henry Ayers and W. T. Johnson, Jr. In their experiments milk was exposed over two drums revolving in troughs in such a manner that the milk was picked up from a trough in a thin layer by one drum, then taken off by a scraper and conveyed to a second tank where it was picked up by the second drum. From thence it was conveyed to a sterile flask. Different thicknesses of the layer of milk could be obtained by rotating the drums at different rates of speed. This also varied the length of exposure.

The ultraviolet rays were generated by a quartz-tube mercury-vapor lamp taking 3.5 amperes from a 220-volt direct current circuit. This tube was four inches above the surface of the drums. The average thickness of the layer of milk was 0.1 millimeter, and the length of total exposure was about two seconds at the slower speed, and one second at the higher speed.

While great reductions in the number of observed bacteria were obtained by this apparatus, in which the temperature of the milk during exposure was never higher than 30 degrees centigrade, the results indicated that it is not possible to completely sterilize milk by this means with lamps of the present power and construction. Data are given showing the reduction in the bacterial content. Usually the number of residual bacteria was only a small percentage of that which is initially observed.

It was found that when the milk was exposed under conditions suitable for a large reduction in the bacterial content, there was also produced an abnormal, disagreeable flavor, which would render milk unsalable.

St. Louis Jovian Meeting.

The Jovian Chapter of the St. Louis League of Electrical Interests was addressed by Henry H. Humphrey at its meeting on March 22. The subject of the paper was "The Largest Office Building in the World." This was a description of the mechanical and electrical equipment of the Railway Exchange Building in that city.

There were over 100 members of the League present to hear this paper. A. C. Einstein, president of the League, occupied the chair.

At the meeting on April 1, Hermann Von Schrenk, consulting timber engineer, gave an interesting talk on "Pole-Line Timber Treatment." There were 90 members present at this meeting.

Electricity in Wire-Fence Manufacture.

Wire-fence plants, having as they do, a high load-factor, are particularly desirable customers for central stations. This article discusses the advantages of central-station service, comments on the machine and motor characteristics and presents operating data on several typical plants.

The original wire-fence plant in which the first commercial wire fencing was made is still in operaton in Adrian, Mich. The opening of this plant marked the beginning of an industry that has subsequently grown to large proportions and today wire-fence factories are located in all parts of the country. From the standpoint of the central-station industry these plants are desirable customers, having as they do, a high load-factor and desirable load characteristics. From the standpoint of the fence manufacturers, central-station service is particularly desirable, due first to its economy and secondly to its many advantages over other forms of power. The more important of these advantages will be discussed later.

Looms for Manufacturing Ornamental Wire Fence, Driven by a 10-Horsepower Motor.

Wire fence is manufactured in an endless number of varieties. In one large plant alone, 130 different styles are made. Of course all plain fencing is similar, the distinguishing features of each style being the methods of binding the upright stays with the laterals, the kind and size of mesh and the gauge of the wire used. In ornamental wire-fence manufacture a greater flexibility in design is possible, but even this is limited to designs of a more or less similar character.

The operations involved in wire-fence manufacture are decidedly simple. Wire, in loose coils, as received from the mills, is usually first conveyed to the spooling room, either by means of conveyors or manually. These loose coils are then rewound on special spools, to insure a continuous, easy feed for the looms. From the spools, the wire is lead to the looms, these wires forming the laterals of the fence and depending in number upon the width of the fence being woven. The stays are supplied from a magazine on the loom and the staples for binding, from a separate staple machine usually located so that the staples can fall by gravity to the staple-magazines on the loom.

The wire forming the stays must necessarily be free from all kinks and bends and, therefore, before being cut into desired lengths is passed through a wire straightener.

In the manufacture of ornamental fencing the operations differ somewhat. The uprights or stays, which in plain fence are automatically inserted and secured by the looms, in ornamental fencing, are inserted and bent in the desired shape by hand. The funetion

of the loom in this case is simply to draw and crimp the laterals and wind the completed fencing in rolls for shipment.

The foregoing outline may perhaps convey some idea of the processes involved in fence manufacturing proper. Some few plants, however, in addition, manufacture gates and fence posts. Punch presses, using special dies, pipe bending machines, shears and saws, etc., are used in this work. Considerable hand work is necessary in constructing wire-fence gates. The posts are usually made in two V-shaped sections, a special forming machine or press being used.

General Advantages of Motor Drive.

In general, the many advantages of motor drive, which are being so universally recognized and which apply in so many industries, apply with equal importance to wire-fence plants. Individual drive is, of course, to be preferred and many progressive managers are so equipping their plants.

The arguments in favor of individual motor drive are numerous, but most of those relating to wire-fence plants can be classified under the following heads: (1) ease and economy of electric-power transmission; (2) flexibility of location of machines in the building; (3) accessibility of motor-driven machines; (4) wide choice of motors as to size, mechanical design, and operating characteristics; (5) perfect control, including readiness of starting, stopping and making speed adjustment; (6) economy of power and time; (7) ability to operate any portion of a shop at any time with power consumption proportional to work done; (8) reduced hazard of accident.

A brief discussion of the advantages, in the order named, may prove of interest.

Industrial work generally requires the application of power at distributed points. No form of prime mover is available which can economically develop power in small quantities at the points of application. The electric motor furnishes the nearest approach to this condition in that electric energy can be economically transmitted and transferred into mechanical energy at the point of application in any quantity desired. When compared with line shafting and belts, the installation of wires for carrying electric current is a very simple and inexpensive operation; in comparing the relative losses in transmission the electrical losses seem almost insignificant.

With electric drive the location of buildings and of the individual machines in a shop is practically unhampered by considerations of power. Buildings can be placed with reference to good labor and transportation facilities, convenience with reference to each other, safety from fires or other disasters, etc., in any case electric energy is easily brought to the required location, the necessary wires being easily installed in space not valuable for other purposes. The machines in a plant can be placed so as to require minimum handling of material and to obtain most economical production; also, better light and ventilation can be given proper consideration. No matter how remote or inaccessible the corner in which the work is to be done, the motor-driven machine can fill the requirements.

The flexibility extends to the rearrangement of machines to conform to changing manufacturing requirements. A motor-driven machine can be moved from one location to another as a unit without disturbing or interrupting any other machines. The only changes required on account of the power supply are the disconnection of the electric conductors in the old location and their reconnection after the machine is moved. This process is extremely simple compared with that of relocating line shafts and belts. The best arrangement for maximum productive economy can thus be maintained, under changing manufacturing conditions.

Additions to plants employing motor-driven machines and central-station service require very little consideration on account of power, other than the wiring.

With motor drive the machines become more accessible and the operators are unhampered by the close proximity of countershafts and overhead belts. This is particularly important in wire-fence plants as the operators of the looms must always be making adjustments, refilling magazines, etc. Freer head room also permits easier handling and storage of material.

Electric motors are standardized in sizes, shapes and with operating characteristics suitable for almost every conceivable application.

By the use of a motor for each machine any machine can be shut down when not in use, thus stopping all wear and loss of power in friction. This is not the case with the line-shaft drive, as the wear and the friction losses in the shafting are only slightly less when all the belts are on their loose pulleys than when all the machines are working. This possibility of saving power with motor drive is an argument for the use of individual motors on the various machines or groups of machines. Each machine thus driven is an independent unit; group drive makes each group totally independent of all other groups. Hence in the case of over-time work, only the machinery required need be operated.

Group of Looms, Each Driven by 7.5-Horsepower Motor.

Speed adjustment with motor drive is a simple matter, and a motor can be selected such that the speed at any adjustment will be practically constant at all loads. This feature enables a machine to be operated always at the most economical speed. A simple movement of a controller handle at any convenient point near or remote from the motor, changes the speed in-

(Continued on page 691.)

Wire Fence Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Wire-fence plant, manufacturing 130 different styles of fencing, using wire of all sizes ranging between No. 4 gauge and No. 16 gauge. Gates of various styles, and fence posts are also manufactured. The output of the plant for the year 1912 was 26,000 tons of wire fence and the estimated output for 1913, 30,000 tons. In addition, all loom repairs for the company's various plants are made in this establishment. Plant operates 10 hours per day.

Total connected horsepower, 695. Total number of motors installed, 20. Average kilowatt-hours per month, 90,550.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	64,000	May	98,800	September	93,500
February	88,900	June	94,100	October	93,100
March	91,100	July	97,700	November	90,700
April	97,700	August	80,000	December	88,000

Load-factor, 24 per cent; operating-time load-factor, 50 per cent.

Motor Installation.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts, with a direct-current circuit for crane and hoist motors about the plant. Squirrel-cage induction motors are installed.

No.	Horse-power	Speed R. P. M.	Application.
1	10	1200	Belted to line shafting driving six ornamental-fence looms, made by the Barnes Manufacturing Company; three I. J. Noracher automatic wire crimpers; one hack saw; one band saw; one woodworking lathe; and one cut-off saw.
1	30	950	Belted direct to paint stirring paddles.
1	30	950	Belted to line shaft driving machine-shop equipment comprising four Cincinnati milling machines; one Smith and Mills shaper; two Barnes drill presses; one hack saw; and one double emery wheel.
1	75	900	Belted to a line shaft driving eight looms; and three wire straighteners.
1	30	900	Belted to line shaft driving eight wire spoolers.
1	50	900	Belted to line shaft driving three looms; and six wire straighteners.
1	50	900	Belted to a line shaft driving three looms; and four wire straighteners.
1	30	900	Belted to line shaft driving two looms; and one spooler.
1	10	1120	Belted to conveyor for handling wire coils.
1	20	1120	Belted to line shaft driving eight looms; and conveyor for wire coils.
1	125	750	Belted to line shaft driving eight looms.
1	30	900	Belted to line shaft driving eight spoolers; and coil conveyor.
1	5	1200	Belted to coil conveyor.
1	10	1120	Belted to line shaft driving two repair looms.
1	15	1130	Belted to shaft driving 400-ampere generator.
1	25	1150	Belted direct to 3,000-ampere generator.
1	20	1130	Belted direct to 400-ampere generator.
1	10	1200	Belted to shafting driving two R. & K. No. 3 punch presses; one hack saw; one drill press; and one 12-inch double emery wheel.
1	20	1050	Belted to line shafting driving one hack saw; one small drill press; one 50-pound trip hammer, and one engine lathe.
1	100	1720	Vertical motor direct-connected to fire pump.

Small wire-fence plant located in Adrian, Mich., manufacturing stiff-stay fencing in several sizes. The total output of this plant in 1912 was 6,500 tons, or 1,335,000 rods of fencing. Plant operates 10 hours per day.

Total connected horsepower, 62.5. Total number of motors installed, 8. Average kilowatt-hours per month, 6,695.

Kilowatt-hour consumption for 12 months: January, 6,530; February, 6,950; March, 5,900; April, 6,910; May, 6,695; June, 6,460; July, 8,050; August, 6,000; September, 6,500; October, 6,600; November, 6,460; December, 6,600.

Load-factor, 20 per cent; operating-time load-factor, 41 per cent.

The approximate electrical energy consumption per ton of fence manufactured is 12.3 kilowatt-hours.

Motor Installation.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power	Speed R. P. M.	Application.
2	10	1120	Each belted to a countershaft driving one staple machine; and one loom.
5	7.5	1200	Each belted to a countershaft driving one staple machine; and one loom.
1	5	1200	Belted to a line shaft in machine shop driving one Barnes drill; one Cincinnati shaper; two small lathes; and one double emery.

Wire Fence Data—Sheet No. 2.

Wire-fence plant, located in Michigan; manufacturing a high grade of continuous-stay fencing using wire ranging in size from No. 9 to No. 14 gauge. The average yearly output is 2,900 tons of fence. Plant operates 10 hours per day.

Total connected horsepower, 50. Total number of motors installed, 7. Average kilowatt-hours per month, 3,560.

Kilowatt-hour consumption for 12 months: January, 3,070; February, 3,220; March, 3,980; April, 3,870; May, 4,170; June, 4,550; July, 3,710; August, 2,460; September, 2,580; October, 2,450; November, 4,850; December, 3,450.

Load-factor, 13 per cent; operating-time load-factor, 28 per cent.

The approximate electrical energy consumption per ton of fence manufactured is 15 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts. Motors are of the squirrel-cage induction type.

No.	Horse-power.	Speed R. P. M.	Application.
4	7.5	1,800	Each motor belted to a countershaft driving one staple machine; and one wire-fence loom.
1	10	1,750	Belted to a countershaft driving one staple machine, and one double wire-fence loom.
1	5	1,200	Belted to a line shaft driving one Lodge & Shipley lathe; one Marshall & Huschart lathe; one Gould & Eberhard shaper; one Lodge & Davis No. 1 milling machine; one 12-inch double emery wheel; and two Barnes drill presses.
1	5	1,200	Belted to a line shaft driving four wire spoolers.

Wire-fence plant manufacturing a continuous-stay square-mesh fence, using No. 9 gauge wire throughout. A complete line of fence posts and gates is also manufactured. The average yearly output of the plant is 3,000 tons or 600,000 rods of fence, 150 tons of steel posts, and 75 tons of gates, a total tonnage of 3,225. Plant operates 10 hours per day.

Total connected horsepower, 65. Total number of motors installed, 8. Average kilowatt-hours per month, 3,820.

Kilowatt-hour consumption for 12 months: January, 1,200; February, 1,560; March, 2,040; April, 3,800; May, 5,480; June, 5,360; July, 4,760; August, 5,400; September, 6,080; October, 3,680; November, 2,980; December, 3,900.

Load-factor, 11 per cent; operating-time load-factor, 23 per cent.

The approximate electrical energy consumption per ton of metal worked is 14.2 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts. All motors are of the squirrel-cage induction type.

No.	Horse-power.	Speed R. P. M.	Application.
1	10	1,200	Belted to a line shaft driving one shaper; one small lathe; two milling machines; one drill press; one bolt cutter; one forming press for fence posts; one staple machine; one Niagara shearing machine; five Toledo Machine & Tool Company No. 75 punch presses; one small gate-frame bender; one bobbing machine; and one wire straightener.
5	7.5	1,800	Each belted direct to a countershaft driving one staple machine; and one wire-fence loom weaving fence of 58 inches maximum width.
1	10	1,200	Belted to a line shaft driving five staple machines; five wire spoolers; and five wire straighteners.
1	7.5	1,200	Belted to line shaft driving three wire spoolers.

Wire-fence plant located in Adrian, Mich., manufacturing all styles and weights of stiff-stay fence, but no gates. The total output of this plant in 1912 was 16,150 tons, or 3,351,346 rods of fence. Plant operates 10 hours per day.

Total connected horsepower, 160. Total number of motors installed, 12. Average kilowatt-hours per month, 20,210.

Kilowatt-hour consumption for 12 months: January, 13,100; February, 18,800; March, 21,600; April, 23,600; May, 22,200; June, 21,000; July, 16,800; August, 15,600; September, 26,900; October, 21,500; November, 22,200; December, 19,300.

Load-factor, 24 per cent; operating-time load-factor, 48 per cent.

The approximate electrical energy consumed per ton of fence manufactured is 15 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts. All motors are of the squirrel-cage induction type.

No.	Horse-Power	Speed R. P. M.	Application.
10	15	1,200	Each motor belted to a countershaft driving one staple machine; and one wire loom.
1	5	1,120	Belted to a line shaft driving one hack saw; one 50-pound trip hammer; and one Barnes drill press.
1	5	1,750	Belted to a line shaft driving one Barker & Chard milling machine; one Le Blond No. 2 milling machine; one engine lathe; one turret lathe; and two Barnes drill presses.

stantly, and the number of possible speeds can be made as large as desired. Moreover these conditions remain the same during years of service. With mechanical transmission the number of speeds is comparatively small and the speed increments large; moreover, the change of speed is troublesome, and workmen are often tempted to operate with uneconomical speed rather than change it.

A motor-driven machine consumes energy only while operating, and then only in proportion to the work done. Electric motors are very efficient machines in all sizes and at all loads within the ordinary working range, which is more than can be said of any small prime mover. The use of motors moreover eliminates some or all the losses due to friction of line shafts and belts. These losses consume anywhere from 30 to 60 per cent of the energy required to operate an ordinary shaft-driven shop or mill, and they are continuous, even though only a few of the machines are operating. Very few machines are in actual service more than half of the time, the cessation of all energy losses chargeable to each machine, except while it is in productive operation, constitutes a very large saving in power. This is perhaps the most important of the various advantages of motor drive as applied to wire-fence manufacture. Especially in the slack periods of the year, namely in mid-summer and mid-winter, only a few of the looms are in use and when central-station power is used the operating costs are of course reduced.

Machine and Motor Characteristics.

The loom is, of course, the principal machine in a wire-fence factory, but its characteristics must be studied separately for every plant, as in each case looms are home-made machines. The reason for this is that, in general, the product of the various fence manufacturers differs only in the method of binding or securing the uprights to the laterals and as each method is a patented process, special machines must be constructed. Under these circumstances no machine manufacturing company could or would undertake to build looms, which would have to be entirely different for each customer, at a cost that could compare with the home-made product.

As has been mentioned, the operation of the loom is comparatively simple and entails no special problems in arranging for motor drive. Wires from the spools are led through loose pulleys to the loom frame, the number depending upon the width of the fence and their distance apart depending upon the size of the mesh. As these lateral wires pass through the loom, the stays or uprights are automatically placed in position and self-feeding dies press a staple around each junction of lateral and stay.

Where fencing other than that of the continuous-stay variety is being made, the uprights are secured by being wound around the laterals, or by other means.

The power requirements of looms are so variable that no specific figures can be given. The horsepower required depends upon the speed at which the loom is being operated, the size of the wire being used, the style of fence, etc. In the average plant, however, a 7.5 or 10-horsepower motor is used for each loom. This also drives the staple machine, which is a part of the loom equipment, and the usual method of drive is to belt from the motor to a countershaft provided with two pulleys, one for the staple-machine belt and one for the loom. In other cases the motor is provided with an extended shaft from which connection is made to the staple cutter. In either case the latter is provided with a flywheel to equalize the load on the motor.

The speed of the loom depends upon local conditions, but in every case it is constant. Squirrel-cage induction motors are, therefore, recommended for this work. An average production figure for looms is 120 rods of wire per hour.

Other machines found in wire-fence plants such as punch presses, shears, bending machines, which really relate to the gate and post end of the business, are common to many industries and comprehensive data relative to their characteristics and power requirements are available.

Due to the fact that looms are constructed and kept in repair at the factory, a completely equipped machine shop forms a part of every wire-fence establishment. In this connection attention is called to an article on electricity in machine shops, appearing in our last issue.

Staple Machines (on Platform) Driven by 30-Horsepower Motor.

Wire Spoolers Driven by 10-Horsepower Motor.

Electric Welding.

In the manufacture of gates and to some extent in wire-fence manufacture welding is necessary and electric welders are being widely used for this service. This method is gaining rapid acknowledgement as its great advantages combined with inexpensive machinery and easy manipulation become more generally known. Great improvements have been made in electric welding machines during the past few years and today efficient machines being automatic in their working, and extremely simple in every respect, are available.

The principle involved in the system of electric welding known as the Thomson system is that of causing currents of electricity to pass through the abutting ends of the pieces of metal which are to be welded, there-

by generating heat at the point of contact, which also becomes the point of greatest resistance, while at the same time mechanical pressure is applied to force the parts together.

The power required for the different sizes varies nearly as the cross-sectional area of the material at the joint where the weld is to be made.

The following figures from Foster's hand-book, are based on very careful tests:

ROUND IRON AND STEEL.

Diameter, Inches.	Area.	Horsepower Required.	Time in Seconds.
0.25	0.05	2.0	10
0.333	0.10	4.2	15
0.5	0.22	6.5	20
0.625	0.30	9.0	25
0.75	0.45	13.3	30

The time given is that required for the application of the current only, and may be shortened with a corresponding increase in the amount of power applied.

In several wire-fence plants located at Adrian, Mich., electric welders are being used with marked success. In each case the energy is metered separately.

Commercial Practice
Management, Rates, New Business

ELECTRICITY ON THE FARM.

Details of a Few Typical Installations That are Mutually Profitable to Customer and Company.

The idea is more or less general that electric power and light is to be enjoyed by cities and towns only. The farmer, however, is fast coming to realize the value of electrical energy and to make use of it. Every year sees new and interesting farm installations, which means more economical operation of the farm machinery and more comfort to the farmer and his family.

For the farmer, electricity fills a peculiar need, because there are so many labor-saving applications for it on the farm—probably more than in any other field. Electricity means more efficient work at a less cost and in less time. This is especially true because while electricity is becoming cheaper, human labor is rapidly becoming more expensive. With electricity, the farm house can have all the conveniences of the city home; there are fewer servants needed in the house and in the field, and there is more time for recreation.

One can hardly realize the saving of time and strength electric light in the house means to the farmer's wife; the care of the usual kerosene lamps and lanterns on farms is very disagreeable work and consumes several hours a week. Electric lights in the barn and out-buildings mean a great convenience for the farmer, and the risk of fire, always present if lanterns are used, is eliminated.

The supply of electricity to farms has, however, been retarded largely by the cost of furnishing service to isolated customers. In some cases this expense is divided between customer desiring service and the central station company, and in other cases the entire expenses is borne by the customer. It has been found that the most satisfactory method of developing this business, which works the least hardship on both company or customer, is to solicit the business of surrounding villages and towns, which can and do usually offer a good return on the investment, and along these transmission lines, encourage the use of electricity on the farm.

Before taking on any rural business the central-station company should have in mind some definite concrete proposition such as a 10-year franchise for street lighting or a contract with some other reliable customer, the returns from which should be sufficient to justify the investment, in view of the prospective farm business along the lines.

Fig. 1.—Electric Range and Motor-Driven Pump.

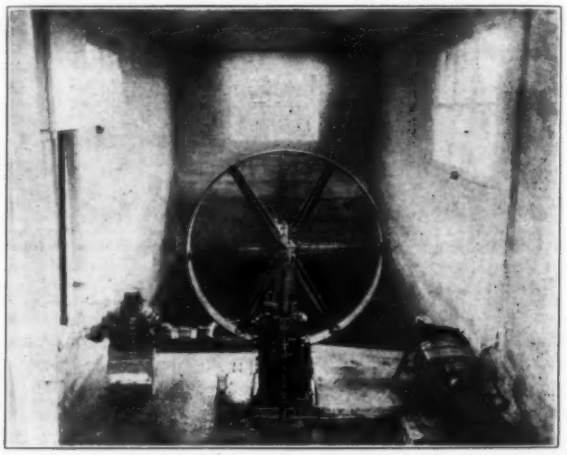


Fig. 2.—Motor-Driven Pump for Supplying Drinking Water.

The Dayton (Ohio) Power & Light Company has made considerable progress in this matter at present supplying current to four rural districts, varying in distance from 4 to 8 miles. In these towns the company is supplying current for a total of 54 75-watt Mazda street lamps, burning on an all-night every-night schedule, for pumping water for the villages, and in one case, for a 35-horsepower motor installed in a grain elevator and feed mill. The communities served are very well pleased with the service and are good boosters for electric service.

The company is deriving a very satisfactory revenue from these communi-

ties, alone, and still has a large field for additional business among the farmers located along the transmission lines. Two installations along these lines are especially noteworthy as they represent practically the full extent to which electricity can be utilized on the farm. The installation on the estate of William Stroop consists of one 15-horsepower three-phase, 220-volt motor mounted on skids so as to be used about the farm for duties such as threshing grain, shelling corn, hoisting corn, hay, etc., etc. The installation also includes one 5-horsepower motor for pumping domestic water; one 0.5-horsepower slow-speed motor for operating a cream separator and laundry mangle; one 0.25 horsepower motor for pumping soft water for domestic purposes and two electric ranges upon which all cooking is done.

In addition there are numerous appliances such as flat irons, toasters, fans, and other household appliances used. The monthly kilowatt-hour consumption covering a period of one year is presented herewith.

	Light.	Power.	Cooking.
February	205	270	...
March	164	440	...
April	156	270	...
May	99	50	...
June	143	...	420
July	252	110	625
August	126	80	558
September	147	270	651
October	277	130	755
November	331	300	674
December	352	110	625
January	282	100	714
Total	2,534	2,130	5,022

small motors are also installed in the garage, operating air pump, in the dairy operating separators, and refrigerating machine, and in the house op-

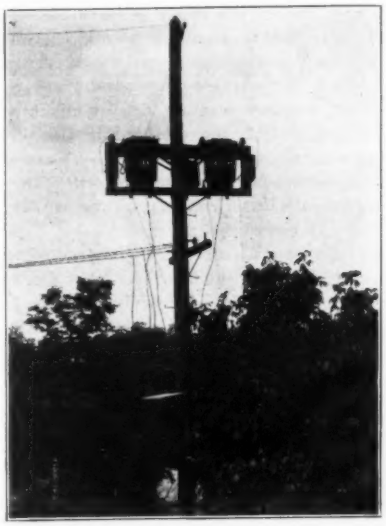


Fig. 3.—Typical Farmer's Substation on Dayton Company's Lines.

erating pumps, washing machine, vacuum cleaner, mangle, etc. Two electric ranges are also installed. In the accompanying table of monthly kilowatt-hour consumption, the cooking and power consumption figures are combined.

In both instances the cost of threshing has been reduced and both customers are enthusiastic over the conveniencies of electricity. Figs. 1 and 2 are views of Mr. Deed's installation, the former showing one of the electric ranges and a motor driven pump; and the latter a motor-driven pump in the spring house.

A model electric installation in another section of the country is that on the Crescent farms owned by John Clelland of Scranton, Pa. The farms, which are devoted to the raising of fine stock, principally cattle, are located at Mt. Cobb, Pa., near Scranton.

The largest motor, located in the barn, and shown in Fig. 4 is a five-horsepower, 115-volt direct-current machine used to operate a threshing machine, a corn or feed grinder (shown in the illustration), a root cutter, and a straw cutter. It will be noticed that the motor is located on a shelf in an out-of-the-way place and above the main entrance to the barn; when it is desired to operate any of the machines, the same is brought out on the barn floor in line for belting to the motor pulley.

The smaller motor is a two-horsepower machine geared to a shaft in the creamery. This shaft is belted to the churn and can also be geared to the pump. This being a stock and dairy farm, a reliable water supply is essential; a windmill was used to pump, but was so unreliable that the

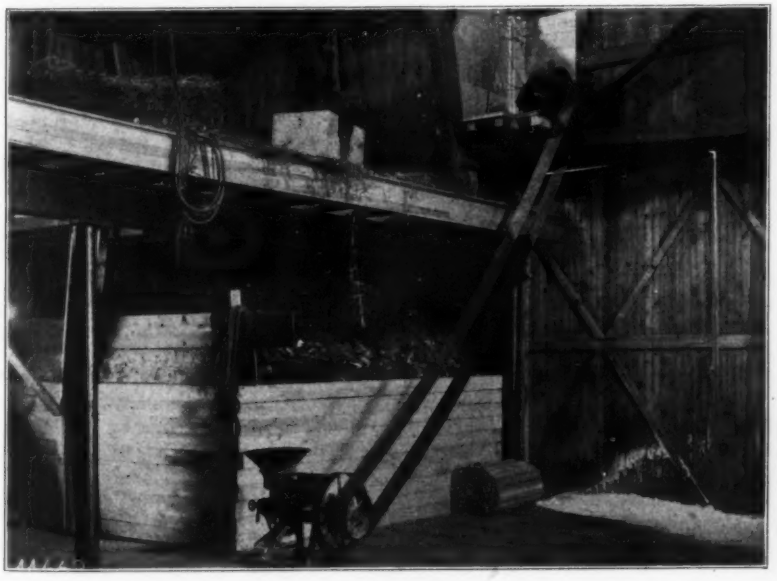


Fig. 4.—Motor-Driven Mill.

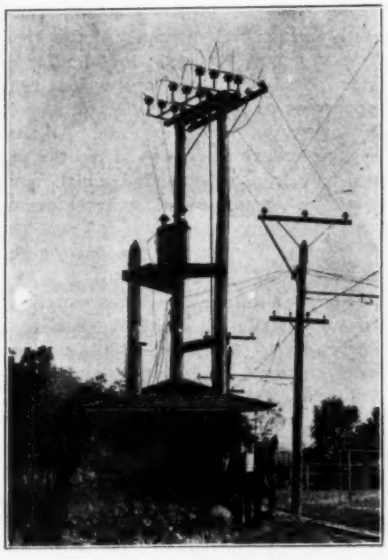


Fig. 5.—Substation Along Railway Line.

The farm of E. A. Deeds is also completely equipped in every respect. The installation consists of one 15-horsepower three-phase, 220-volt motor mounted in a portable manner, for general utility purposes. Various

Month.	Light.	Power.
May	...	760
June	...	217
July	...	354
August	...	221
September	179	961
October	149	618
November	264	829
December	352	901
January	366	697

motor is also employed when necessary.

Electricity is used in the owner's residence for washing, ironing, sewing and other household duties. On the farm there are about a hundred 25

and 40-watt wire-type tungsten lamps. These are in the barn, the greenhouse, the hennery, the three houses of the help, and the large residence of the owner.

All the electrical apparatus was installed about three years ago; a farm boy has been able to give it all the attention it has needed. The installation was not expensive, and has proven very economical and satisfactory.

Located about two miles outside of Marietta, Ohio, on the banks of the Muskingum River, is still another noteworthy installation. The farm is owned by W. W. Mills, a Marietta banker, who is also vice-president of the Parkersburg, Marietta and Interurban Railroad Company. This company, in addition to operating the railroad between the cities of Parkersburg and Marietta, also supplies light and power in these cities.

The farm consists of about 60 acres of very valuable land; approximately one-half of which is located along the river bank and is of the very richest kind of soil. Mr. Mills decided some time ago to have a modern and up-to-date farm, and selected this locality as being specially suitable. The trolley road runs parallel with the river and directly through the farm, so that it affords excellent transportation facilities to and from Marietta and Parkersburg.

Wishing to avail himself of all modern advantages, Mr. Mills naturally turned to his own company for suggestions as to the possible use of electricity on the farm. On consulting with the general manager of the electric company, it was found that it was possible by use of outdoor-type apparatus to secure the electric energy at a very reasonable expense. All that was necessary to do was to tap the 22,000-volt transmission line which runs past his farm, install a transformer and switching apparatus, and use the current in various applications on the farm.

Fig. 5 shows clearly the simplicity of the installation which consists of a three-phase, 60-cycle, 15-kilovolt-ampere standard outdoor-type transformer, giving 110 or 220 volts on the secondary. The small building contains the switchboard, a watt-hour meter for measuring the energy received, and the auto-starter for a 10-horsepower motor which is located about 1,200 feet away on the river bank. The motor is used for pumping water into a tank located just back of the house. When desired, it can be used for irrigating the truck farm; an operation accomplished by means of several valves which can be opened and the water allowed to flow by gravity through some piping which is perforated at intervals, thus spraying the water over the land.

Appreciating the many advantages of electrical devices in the home, advantage was taken of the electrical installation to light the residence and equip it with the many modern electric devices that do so much to make home life easy. Accordingly, there were installed therein electric toaster-stoves, irons, vacuum cleaner, sewing machine motor, and all the washing is done by an electric washing machine. Numerous other electrical devices have been added to this "modern home on the farm."

This installation has proved conclusively to the officials of the railroad company that it is entirely feasible to tap, for power and lighting purposes, the transmission line, which had heretofore been used only for supplying energy to the railway. By this means, it is possible to supply a number of villages and small towns along the line or railway, and thus derive a very considerable revenue at a small outlay of expense.

If the company is able to make from 10 to 15 taps, ranging from 15 to 100 kilovolt-amperes capacity, on a transmission line of from 15 to 20 miles long, it would derive enough revenue to pay the entire maintenance of the line. This phase of the situation is becoming more thoroughly appreciated by central-station managers, and the prospects are that the near future will see a very considerable amount of business secured from farms along interurban trolley lines.

How the Adrian Central Station Increases Its Business.

The method of soliciting new business inaugurated in Adrian, Mich., by H. A. Fee, manager of the Citizens Light & Power Company may well be considered ideal for communities of this size. The company employs an inspector whose duty it is to make periodical calls on all customers—both power and lighting—to see that motors are operating satisfactorily, switches and connection in proper order, burnt-out lamps renewed, and all domestic appliances kept in good working condition. Incidentally flat-iron cords and terminals are renewed free of charge.

As the inspector makes all necessary repairs he must carry with him a supply of parts and tools and for this purpose is provided with an electric runabout in which he also carries a complete stock of irons, toasters, and other appliances. While making inspection calls, advantage is taken of the opportunity to discuss the merits of these appliances and invariably, the result is a trial installation. Needless to say the percentage of appliances returned is insignificant compared to the sales made. All time not occupied in this manner is devoted to securing the business of those who are not already using central-station service.

Although having a high regard for newspaper and circular advertising, Mr. Fee is highly enthusiastic over the results obtained by the combination inspection-solicitation method described. It is obviously desirable to make periodic inspections of customer's installations and if this can be combined with soliciting, a double service is being obtained with marked economy. Incidentally, also, the use of electric runabout in this work has created considerable interest in this method of transportation.

In addition to a very attractive motor load and residence and commercial-lighting load, the Citizens Light & Power Company has placed 621 flat irons, 37 heating pads, 134 desk fans, 31 ceiling fans, 6 sewing-machine motors, 14 washing machines, 25 vacuum cleaners, and 32 toasters. The population of Adrian is in the neighborhood of 11,000 inhabitants.

An Easter Window Display.

Hatched by electricity out of a Cyphers incubator, 75 lusty chicks gambol in the window of The Electric Building, of the Kentucky Electric Company, of Louisville, Ky., providing the finishing touch to one of the most striking effective window stunts ever staged by that company, an exhibit which at no time failed to draw its meed of attention from the passing throngs and which ultimately packed the window with a 10-foot wall of humanity outside when the youngsters began picking at their shells in the electrically warmed chamber. The Easter trim of the Ky-El-Co, commenced four weeks ago, when a batch of 98 Plymouth Rock eggs was placed in the incubator and the current turned on, has been wonderfully successful in demonstrating to the public the practical value of electricity in poultry-raising. The incubator was carefully watched, the eggs turned and cooled regularly, and a careful record of the amount of current consumed was kept. Out of 98 possible chances, the incubator scored 75 chickens, a remarkably high average, and the consumption of current was 14 kilowatt hours, or approximately a cent's worth of electricity per chick. After gaining the required strength during a few hours of warmth in the incubator, the flock was turned into an electric brooder, and reposed in full view of the public all during Eastertime. A chicken dinner, Southern style, is probably ahead of the Ky-El-Co office force when the springers reach the broiling stage.

Electrical Construction

Changes in the National Electrical Code.

The meeting of the Electrical Committee of the National Fire Protection Association held in New York, March 26 and 27, for the biennial revision of the National Electrical Code, was said to be, in point of attendance and interest manifested, one of the best meetings of the kind yet held.

The changes in the Code which were to be considered were distributed, as is the custom, in pamphlet form among the various electrical interests throughout the country several weeks in advance of the meeting. The members of the Electrical Committee then held the usual two-day convention, on March 24 and 25, for the discussion of these proposed changes, the meetings during these two days being in closed sessions. Finally, on March 26 and 27, the recommendations of the Committee concerning each suggested change in the Code were read in open meetings, where there was opportunity for anybody interested to discuss the change, after which discussion the final vote on the matter before the house was taken.

This explanation, it should be mentioned, is inserted here because it is believed that it will prove interesting to readers not familiar with the present method of revising the Code. The more important changes in the Code made at the recent convention are given in the following:

Rule 3*b* was revised to prevent the use of combustible materials in switchboards. The rule will hereafter read "Must be made of non-combustible material", the second paragraph being stricken out altogether.

Rule 4*a* was changed to require the holes where heads of bolts holding rheostats on a slate or marble panel are countersunk to be covered with an insulating material.

From Rule 8*c*, third paragraph, the clause "if they are inoperative, etc." is to be stricken out.

Rule 12*m* is to be stricken out, as is also Rule 14*a*.

Rule 14*b* is to be changed so that special permission will not be required when a transformer whose voltage is below 550 is to be attached to the walls of a building.

The recommendation of the committee on Rule 15 to make the grounding of transformer secondaries mandatory in the Code was adopted. Grounding is not to be mandatory, however, in the case of industrial private power and lighting plants. It will be recalled that this change will require the secondaries of transformers to be grounded, provided the maximum difference of potential between the grounded point and any other point does not exceed 150 volts. Sections *b* to *g* inclusive, of this rule, were referred to the Committee on Pole Lines.

Rule 23*d* is to be re-worded so as to include small motors and small heating devices along with incandescent lamps. The maximum number of sockets on a 660 watt circuit is to be specified also, this number being sixteen.

Rule 23*d* as it was amended will read: "Must be so placed that no set of small motors, small heating devices or incandescent lamps whether grouped on one fixture or on several fixtures or pendants, nor more than 16 sockets or receptacles requiring more than 660 watts, will be dependent upon one cut-out. By special permission in cases where wiring, equal in size and insulation to No. 14 B. & S. gauge approved rubber-covered wire, is carried direct into keyless sockets or receptacles and where the location of sockets and receptacles is such as to render unlikely the attachment of flexible cord thereto, circuits requiring 1,320 watts may be used. Except for signs and outline lighting, sockets and receptacles will be considered, for purposes of installation, as rated at 40 watts each." Last suggestion as given in bulletin adopted.

Rule 23*c* will be amended so that approved link fuses may be mounted on approved porcelain bases, as well as on bases of slate or marble.

Rule 23*a*, first paragraph, will be amended so that permission in writing must be had whenever there is any departure from this requirement.

Where knife switches open vertically upward, a locking device to keep gravity from closing them will be required.

Rule 24*c* will be changed by the insertion of the words "or circuits in damp places" after the words "signs" in the first paragraph.

The last sentence of Rule 24*d* is to be stricken out; also the fine-print note in Rule 26*g* and the third paragraph of Rule 26*h*.

The 1913 edition of the Code will require the doors of cutout cabinets to shut closely at all edges against a rabbet formed as a part of the door or trim, or else the door must have turned flanges at all edges. Cabinets must be deep enough to allow the door to be closed when 30-ampere branch-circuit switches are in any position and when larger single-throw switches are thrown open as far s their construction and installation will permit.

In Rule 24*d* a new paragraph was adopted, to read: "Where in floor outlets attachment plugs are liable to mechanical injury or the presence of moisture is probable, floor outlet boxes especially designed for this purpose must be used."

The present Code specifications concerning sockets will be slightly modified. During the discussion of the report of the Committee on Sockets, Joseph G. Swallow, of New York, spoke at some length concerning troubles with the 250-watt sockets now in common use. In view of the present practice of attaching small heating devices and small motors to lamp sockets, he thought the use of the 250-watt socket might very well be discontinued, and was disposed to make a recommendation to this effect. Dana Pierce, of the Underwriters' Laboratories, said that there might even be trouble with 660-watt sockets on account of their fragility. He thought that a large part of the disorder arose from the fact that present types of sockets are not sufficiently strong to withstand the rough usage to which they are now frequently subjected. The proposition to discontinue the use of 250-watt sockets was, at the suggestion of W. H. Blood, Jr., referred to the Committee on Sockets, to be reported upon at some future meeting.

The adoption of a new rule for requiring the use of standard outlet boxes or outlet plates on knob-and-tube wiring was one on which the Electrical Committee recommended no action. E. N. Davis, of Brookline, Mass., and William Lincoln Smith, of Concord, Mass., spoke at some length in favor of the adoption of the proposed rule. They felt that the use of a fitting of

the type mentioned would greatly improve the stability of lighting fixtures and so reduce the liability of their being pulled or worked loose from the ceiling by careless persons. They felt, moreover, that it was a good plan to have the fixture canopy closed at the top, and that the use of the outlet box would result in a better kind of construction in other ways. Ernest McCleary, of Detroit, opposed the adoption of the rule on the grounds that the resulting improvement would not be sufficient to justify the increased cost of wiring. He felt that electrical contractors, as a class, were not in favor of such a requirement. In the discussion of this matter, attention was called to the advantage of using the standard clamp now on the market for holding flexible tubing in place at outlets. Many of the speakers seemed inclined to favor putting a rule in the Code making the use of this clamp mandatory; the matter was referred to a Committee for further consideration.

Rule 26*l* was amended to allow 1,320 watts as the maximum for circuits in metal molding, instead of 660 watts as heretofore.

Rule 28*f*, first paragraph, was changed to read, in the third line, "other suitable grounds" instead of "suitable ground plate". The same substitution is to be made in Rule 29*d*, first paragraph.

Rule 31*b*, first paragraph, is to be amended to read "in damp or wet places, weather-proof sockets especially approved for the location must be used." The rest of the paragraph remains unchanged.

A provision was adopted permitting the ground wires on lightning arresters to be run in iron pipes, provided thorough electrical connection is made between the wire and the pipe at both ends of the latter, this connection to be made either by soldering or by means of approved ground clamps. This provision will be an amendment to Rule 5*c*.

A recommendation to add a section to Rule 8 to cover the size of wires and cables needed for alternating-current motors was referred to the Induction Motor Committee, and the matter of inserting special requirements in the Code concerning the installation of 6,600-volt motors was referred to a special committee to report at the next meeting.

Secretary Sweetland announced that the Electrical Committee had recommended the adoption of the idea contained in a suggestion that Rule 23*d* be amended as follows:

"Rule 23*d*. Amend fourth paragraph to allow 10-ampere fuses on 110-volt circuits, and 5-ampere fuses on 220-volt circuits and add sentence: 'When 1,320 watts are dependent upon one fusible cutout, as is permitted in theatre wiring, outline and large chandeliers, the fuses may be 20 amperes for 110-volt systems and 10 amperes for 220-volt systems.'

"Rule 23*d*. Permit branch circuits to be fused to 10 amperes."

The suggestions are to be reworded to conform to the amended Rule 23*d* already referred to.

A paragraph is to be added to Rule 26 which will make it clear that single-braid wire may be used with metal molding.

The first paragraph of Rule 38 is to be amended so as to require stage and gallery sockets to be insulated from the ground. Rule 38 is also changed so as to permit the use of motor-driven moving picture machines. This provision, however, was made at a meeting of the Electrical Committee last spring and printed in the list of approved fittings.

Rule 41*c* was changed to read: "If feed to car house is underground, an emergency switch must be installed within the building at an approved place and as near as practicable to where the underground feeder enters the building."

To the first paragraph of Rule 59*e* a sentence will be added which requires fixture studs not a part of the outlet box to be made of malleable iron or other approved material.

From the first line of the third paragraph of Rule 83*b*, the word "transformers" is to be omitted, this rule referring to the installation of electric signs.

Rule 85*e* will be changed so as to permit both wires of a signal circuit to enter the building through the same bushing, if desired.

The matter which aroused more interest than perhaps anything else which came before the convention was the proposal to strike out "and to make it difficult for it to be replaced when melted" from the second paragraph of Rule 68*d*, which now reads: "The fusible wire must be attached to the terminals in such a way as to secure a thoroughly good connection and to make it difficult for it to be replaced when melted." The clause which it was proposed to strike out is the one in the present Code which prohibits the approval of refillable cartridge fuses, of course.

W. H. Merrill, of the Underwriters' Laboratories, said that the committee to which the matter had been referred was without field experience enough along this line to enable them to handle the matter as well as was desirable, and he moved, therefore, that the committee be increased by the addition of a member from each of the cities of New York, Chicago, St. Louis, and Philadelphia. H. R. Sargent, of the General Electric Company, proposed an amendment providing that this subcommittee report the results of its investigations to the Electrical Committee at its regular meeting two years from now. The motion as amended was passed. The result is, of course, that under the 1913 edition of the National Electrical Code no refillable fuse can be approved. It was not announced just how the sub-committee which now has the matter in hand is expected to carry on its investigations.

F. E. Cabot, chairman of the Electrical Committee, stated that it was now hoped to have the new edition of the Code ready in July.

The convention closed with a rising vote of thanks to the New York Board of Fire Underwriters for the use of its hall during the sessions.

Ordinance on Theater Lighting.

The National Board of Fire Underwriters has printed an ordinance, which is suggested by the Board for adoption, regulating the construction and equipment of theaters. It includes the following paragraphs relating to lighting:

Lighting.

The stage section and every portion of the building devoted to the uses or accommodation of the public, also all passages leading to streets, including the open courts and corridors, shall be satisfactorily lighted during every performance, and until the entire audience has left the premises.

Kind.

Only electric light shall be used in the auditorium and stage section, except that gas fixtures having not larger than "one foot" burners may be used in dressing rooms. These shall have soldered to the fixture strong wire guards or screens not less than 10 inches in diameter, so constructed that any material in contact therewith shall be out of reach of the flames.

Supplies.

Where electric current from two separate street mains is available, two separate and distinct services must be installed; one service to be of sufficient capacity to supply current for the entire equipment of the theater, while the other service must be at least sufficient to supply current for all emergency lights, including the exit or signs, and all lights in outside courts, lobbies, stairways, corridors and other portions of the theater which are normally kept lighted during the performance. Where only one supply from a street main is available the connection used exclusively for emergency lights must be taken from a point on the street side of the main-service fuses. When the source of supply is an isolated plant on the same premises an auxiliary service at least sufficient to supply all

emergency lights must be connected to some outside source, or a suitable storage battery within the premises may be considered the equivalent of such service.

Exit and Entrance Lights.

Where illuminated signs are not provided there shall be at least one red light over each exit and entrance opening from the auditorium and stage sections.

Light Control.

All "emergency lights" shall be controlled by a special switch located in the lobby and accessible only to authorized persons.

Stage Switchboard.

The stage switchboard shall have a metal hood over the top, running the full length of the board and fully protecting same from anything falling from above.

Underwriters' Association of the Middle Department Revises Inspection Rates.

A revised schedule of fees for electrical inspections has just become effective in the territory covered by the Underwriters' Association of the Middle Department. The new schedule is as shown in the following tables.

INCANDESCENT-LAMP INSTALLATIONS.

Number of Lamps (Inclusive).	Inspection Fee.
1 to 5	$0.75
6 to 10	1.50
11 to 20	2.50
21 to 30	3.00
31 to 50	4.00
51 to 100	5.00
Each additional 100 lamps or fraction thereof,	1.00

MOTORS AND GENERATORS.

Horsepower or Kilowatt Capacity.	Inspection Fee.
1.5 to 10	$2.00
11 to 20	3.00
21 to 40	4.00
41 and above	5.00
Each additional motor not over 10 horsepower,	1.00
Each additional motor not over 20 horsepower,	1.50
Each additional motor not over 40 horsepower,	2.00

For inspecting fixtures the rate is the same as for incandescent lamps, while the charge per lamp for the inspection of electric signs is one-fourth the regular rates for incandescent lamps. Where the number of lamps is not greater than three, the fee for the inspection of an arc-lamp installation is $1.50, and for each additional lamp above three there is a charge of 10 cents. The initial inspection of the booth of a motion-picture theater is made for $1.50, re-inspections being made at $1.00 each.

The fee for desk motors and fans is the same as that for incandescent lamps. In the inspection of groups of small motors of less than 1.5 horsepower per unit, a fee of $1.50 per aggregate horsepower is charged.

The rate for the inspection of isolated plants is $5.00 for each dynamo of five kilowatts capacity or less, and $10.00 for each machine larger than this, up to 30 kilowatts. This fee covers the inspection of the accessory apparatus as well as the generator itself. Larger units are charged for on a similar scale.

Among the Contractors.

George W. Walther & Company have been awarded the contract for the electrical installation in the new National Bank of Baltimore. Competition was very keen on this particular job as the electrical business of that city has fallen off considerably within the past few weeks.

The J. L. Davis Electrical Company has recently taken over the electrical contracting business of the Will C. Land Electric Company, in Cleveland, Tenn. Of more than 150 old houses wired during the campaign conducted by the Cleveland Electric Light Company, over 100 were wired by this company.

The R. W. Hodge Electric Company, Kansas City, Mo., has opened up its new office and salesroom at 806 Delaware Street. The old plant of the company was destroyed by fire early in January.

Davis & Hull, 942 Commerce Street, Tacoma, Wash., have closed a contract for wiring the $40,000 hotel being constructed at Ruston, Wash., by the Pacific Brewing & Malting Company.

The Electric Service Company, of which J. F. Shoemaker is manager, has recently commenced business at 214-216 Walnut Street, Cincinnati, O. The company does a general electrical contracting, engineering and repair business and makes a specialty of complete plant installation and of the heavier class of repair work, which it is particularly well equipped to handle.

L. A. Herstein, whose offices and shops occupy the building, 323 North Eutaw Street, Baltimore, Md., has been awarded the contract for the new department-store building for Hecht Brothers & Company on South Charles Street.

The Scanlan Electric Company, Cincinnati, O., is installing the electrical work, including wiring and call systems, at the Bethestda Hospital in that city. Work is expected to be completed late in the summer.

The Joseph M. Zamoiski Electric Company is wiring the motors for a large power installation for the Patrick Kennedy Company, in Baltimore, Md. It is said the installation will consist of 450 horsepower in motors.

The Blumenthal-Kahn Electric Company has just completed a contract with the government for installing conduits in the Baltimore Post Office, while the Lord Electric Company is about completing a contract for installing lead-incased cables from the Post Office to the Custom House, a distance of about seven blocks.

Among the larger contracts which the Devere Electric Company, of Cincinnati, is at present working on is one amounting to about $10,000 for the complete equipment of the Guilford School, including conduit, clocks, bells, telephones, motor wiring and all fixtures. A recently completed installation was the street-lighting equipment on the new Gilbert Avenue Viaduct, extending a distance of about a mile, and a contract lately awarded is for a three-phase motor installation in the establishment of the Werks Soap Company.

This company also just completed the installation of fixtures and lighting equipment, consisting of semi-indirect lighting with Doric glassware, for the Long View Hospital Amusement Hall, at Carthage, O.

The city of Portland, Ore., has awarded the contract for the lighting of the new Broadway Bridge, across the Willamette River, to the West Coast Engineering Company, of Portland. This work will cost the city approximately $21,000, and will result in what is claimed to be the finest lighted bridge in the world. There will be about 200 two-light cast-iron brackets, and 50 five-light curb electroliers, on which will be used 100-watt Mazda lamps. There will also be a decorative system consisting of approximately 7,000, four-candlepower carbon-filament lamps. This will all be permanent work consisting of type R. J. condulets and sheraduct conduit through out. The lamps will be mounted upon all the main steel members of the bridge and along the sidewalk level, and it will be 18 inches between the lamps. The systems on the other bridges in the city were installed by the West Coast Engineering Company.

The Kingsbury-Samuel Electric Company, of Baltimore, Md., has been awarded the contract for the electrical installation in the new seven-story concrete warehouse being built for the John E. Hurst Company of that city.

It is reported that the city officials of Tacoma, Wash., are contemplating dispensing with the services of the chief electrical inspector and four of his assistants by placing electricians working in the city under a cash bond to do good work.

RECENT DEVELOPMENTS IN OPERATING EQUIPMENT IN ST. LOUIS FIRE-ALARM OFFICE.[1]

By George McD. Johns.

The new fire-alarm operating switchboards and equipment recently installed and now in service in the St. Louis City Hall are different in design and operation from any fire-alarm switchboard in known use, and are absolutely unique among systems in vogue in other cities of large size, in that the current which operates the system is drawn from one source of energy instead of a plurality of sources, as is the common practice.

The essential principles of the fire-alarm telegraph are the same the world over and the St. Louis office, while not departing from standard methods of handling alarms, offers originality in the simplicity of design and cheapness of its equipment, which is startling to those used to common fire-alarm practice.

For the reception of alarms a plurality of circuits is maintained throughout the city. These terminate in the fire-alarm office through some form of a telegraph relay which operates a local circuit and registers the alarm. These signal lines are operated on closed circuit; that is, current is flowing through them at all times. Thus an open or grounded line is detected immediately. Upon these circuits are placed the fire-alarm signal boxes. Each box is numbered and is equipped with a clockwork mechanism revolving a toothed wheel which in operation breaks the circuit a number of times corresponding to the number of the box. This breaking of the circuit causes a corresponding breaking of the relay in the central office, which, in turn, operates the local sounder or other device for the reception of the alarm.

Upon the receipt of an alarm it is relayed or struck out of the fire department by hand on a telegraph key or by a specially constructed machine over another set of circuits known as joker-circuits. They are equipped as the ordinary telegraph circuit.

In the St. Loius office these joker-lines are also used for the transmission of messages regarding the movement of apparatus, etc., and they are, therefore, arranged as the duplex telegraph. A key, relay and local sounder are used for the transmission of messages, and for the reception of alarms a polarized relay, the local of which operates a tape register, is used. This latter apparatus is operated from the fire alarm office by the use of pole changer which, true to its name, reverses the current in each line once for each blow, thereby operating the polarized relay and register in the engine house.

All alarms are also struck over a separate set of circuits which operate table gongs, this repetition being a matter of precaution should the joker-lines be out of service or fail for any reason.

The above description would cover the details of four out of five manually operated offices in the country.

In the St. Louis office we have forty-four signal-box lines, seven joker-alarm lines and thirteen bell-striker lines. Up to the installation of our new board the signal-box and joker-lines were supplied from current derived from the old-type gravity or blue-stone cell. Each of these signal and joker-lines, fifty-one in all, was fed from a separate unit of battery consisting of from fourteen to thirty cells, approximately one thousand cells in all. Each line also required a local battery for which Gonda or sal-ammoniac cells were used.

The National Board of Underwriters had at various times urged the city to install a storage battery in place of this antiquated equipment. Estimates on the cost of a storage battery ran close to $15,000, and this was reasonable considering the number of units required, the fact that extra units would have to be provided to care for the charging periods, and the charging board itself, which would have been in the neighborhood of thirty feet in length.

The first idea which entered the writer's mind upon taking charge of the office in July, 1911, was that of placing the entire service upon one source of power. To do this with the type of switchboard then in use would not have been possible. Fire-alarm men old in the business said that the common battery idea would not work out, that other cities had tried it and had had to abandon it; the troubles it had brought in had been due to short-circuiting of the batteries when two or more lines became grounded at once; the failure to receive and answer back signals to the fire department from signal boxes under grounded conditions, and, lastly, the danger from lightning due to the slight ground leakage on all lines and the grounded system resulting therefrom. This latter consideration I ignored because of the fact that all telephone systems operate without difficulty from this source of trouble, and, as is well known, they operate their lines from a common battery. In fact as we proceed, telephone men will recognize that the fire-alarm system here outlined is but little different from telephone operation. Ground troubles are eliminated in the new switchboards by the placing of two relays in each circuit, one on each side of the line. When two or more lines become grounded the relays offer sufficient resistance, 150 ohms each, on each side of each line so that the current divides in the lines depending in quantity on the distance of the grounds from the office. Under such grounded conditions, signals sent into the office from boxes located to the right side of the ground are received on the right relay, and signals sent in from boxes located to the left side of the ground operate the left relay.

Now in order to answer back from office to signal box it is necessary to break the circuit in the office on the same side of the ground as that from which it is received, or, in other words, the transmitter and receiver must manipulate the line upon the same side of the ground. In order to accomplish this, a double-pole double-throw switch is placed in each circuit, which reverses the polarity of the line and at the same time cuts the telegraph key on the office switchboard into the left side of the line instead of the right where it normally is. Thus the operator in the office may, by throwing this switch, break either the right or left side of the line.

Each circuit is provided with a milliammeter and each of the line relays lights up one-half of a bull's-eye on the switchboard, this being accomplished as follows. A shield is placed in the middle of a four-inch red bull's-eye, an incandescent lamp on either side of the shield, and each relay thus is made to light up its corresponding half, the normal operation of both relays lighting up the entire bull's-eye. These lamps are inserted directly in the local circuit, current for this being taken from the common battery, passing through a sounder of large size from which the alarm is heard.

The negative side of a common battery is grounded through a small switch, whereupon the grounding of any line drops the relay on the negative side of that line, lighting the left half of the bull's-eye and attracting immediate attention.

It is obvious that by reversing the polarity of the lines by means of the double-pole, double-throw switches before mentioned, grounds showing on the positive side of lines may be made to show on the negative side. By this means the grounds on a number of lines may be all put on one side of the battery circuit, thus balancing the lines one to another. The result is shown on the milliammeters by the return of the needles to normal position, such po-

1 Paper read before the St. Louis League of Electrical Interests, Jovian Chapter, March 11, 1913.

sition being designated by an indicator hand on the instrument.

The battery supplying current for the system consists of thirty cells of 200-ampere-hour capacity, in duplicate, the voltage being 60, and one set charging while the other is in service.

The new switchboards have been in operation since November 14, 1912, and so far have given perfect satisfaction. They were made and set up by the William Wurdack Electric Manufacturing Company, St. Louis. The instruments were placed and all wiring was done by employees of the Fire and Police Telegraph Department. The telegraph keys, terminal plates and sounders were nickel-plated and transferred from the old to the new boards.

The switchboards are black monson slate, consisting of 23 panels 7 feet high by 31 inches in width, all metal work and instruments being nickel-plated and lacquered.

The cost of the entire equipment was as follows:

Terminal board	$ 417.00	
Switchboards	2,736.59	
Cable	569.61	
Nickel-plating	182.50	
140 telegraph relays	404.60	
Total for operating room		$4,310.30
Two new telephone switchboards	$1,261.11	
Storage-battery equipment	1,537.50	
		2,798.61
Grand total		$7,108.91

Thus it is seen that an entire new equipment, absolutely fireproof and up to date, including two telephone switchboards and complete equipment of storage battery has been installed for less than one-half the cost of storage battery only for the old system.

The National Board of Fire Underwriters recommends that a fire-alarm office be equipped with a recording system by which all alarms are automatically registered on a tape as they are received. This means the introduction of a tape register into the local of each signal circuit. The requirement of the St. Louis office would therefore be 44, or as is the usual practice, 11 registers each having four pens. The cost of this equipment is approximately $5,000 or almost the cost of the entire new office. Now, it is a fact that seldom if ever are more than three circuits operating at the same time. It is obvious, therefore, that 41 pens, or 93 per cent, of this equipment is idle at all times. The writer conceived the idea of using one four-pen register and of introducing a selector between the 44 signal circuits and this register so that each of the three circuits in possible operation at the same time would automatically take possession of the three pens on the register and record the alarm, the fourth pen registering the alarm as it is struck in the fire department on the joker lines.

The writer designed and built such an apparatus which is now in operation. This selector cost in the neighborhood of $200. Its operation can be briefly described as follows. A series of small magnet drops or catches are arranged side by side across the vertical side of a slate panel, a branch of the local of each signal circuit is led into one of these drops, and thus each signal circuit operates one of the drops. Each drop holds a small arm about three inches in length against the pull of a spring which pulls it outward and downward when the operation of the circuit releases the magnet catch. These catches and arms may be likened to a miniature circuit-b eaker. The drop arm when released falls against a rod extending across in front of the drops, this rod connects with pen No. 1 of the register. Thus the first drop falling engages the first pen of the register, allowing the alarm coming in from the circuit connected to the drop to be recorded on this first pen. In the circuit leading to the register is a magnet release holding a second rod suspended above the first. Upon the current passing into the first pen of the register this release is actuated, allowing the second rod to fall into place above the first. This second rod is connected to pen No. 2 of the register; therefore the next alarm coming in on another circuit causes its corresponding drop to fall upon rod No. 2 and record on pen No. 2. A third rod is released, falls into place and the third alarm coming in is thus recorded upon the pen No. 3.

This system fails when two alarms begin to come in at the same instant; when, of course, both drops fall upon the same rod; an unlikely condition, however, as the fraction of a second is sufficient to procure the selection of a pen.

When the register ceases running a contact is closed which operates a solenoid connected to resetting levers, the rods are replaced and the drop arms restored ready again for action.

Since the new equipment has been installed in St. Louis, advices from San Francisco state that that city is planning a new office and that the plans are very similar to the St. Louis idea; also, the fire-alarm system on the Panama Exposition Grounds is to be modeled after the new St. Louis office.

Before the work on the new office was begun all the plans and the scheme in full was placed before the experts of the National Board of Underwriters for approval. William M. Johnson, now chief of fire protection and water supply for the Panama exposition, and formerly with the National Board engineers, is one of the gentlemen who examined the plans and expressed himself as being highly in favor of this installation. Under his supervision the Panama Exposition fire alarm system will be built.

Rules Concerning Safety and the Operation of Motors Issued in Topeka.

To protect employees of Topeka (Kan.) concerns who work around electrical apparatus, E. J. Stewart, city electrical inspector, has issued warning cards and printed rules for the operation of motors.

The danger cards are being placed at points where operators and others are exposed to pressures of 600 volts or more. This is the case in a dozen schools, factories and other buildings, it is said.

The printed rules concerning the operation of motors which Mr. Stewart has prepared and is distributing among the users of motors in the city, cover rather thoroughly the points to be observed especially in the proper management of direct-current machines.

Fireproof Cable Burns.

There is reported a serious fire which recently occurred in an English electric power station. Certain cables, made with an outside covering of fireproof braid, were destroyed by fire in a remarkable way. The origin of the fire was a comparatively small blaze that had been started by an accidental short-circuit. Although this first fire was promptly extinguished, it seems that the short-circuit had enormously overloaded the first mentioned cables, to the point of heating their stranded copper cores red hot, The expansion of the cores rent the fireproof braiding, exposing the rubber insulation underneath to the air so that it burst into flame.

Opening Out Endless Belts.

Dynamos are best driven by endless belts, but these often stretch and require to be taken up by an amount less than the length of the lap. To separate the joint readily when required, it should be made with a piece of heavy brown paper between the leather surfaces. This paper offers sufficient resistance to sliding, but may be ripped in half, by use of a chisel or knife, leaving clean surfaces with which to make a new joint of the same kind by the use of a fresh piece of paper. Robert Grimshaw.

National Association of Electrical Inspectors.

THOMAS HENRY DAY, president, 59 Deerfield Street, Hartford, Conn.
H. S. WYNKOOP, vice-president, 13 Park Row, New York, N. Y.
WILLIAM LINCOLN SMITH, secretary and treasurer, Concord, Mass.
JAMES E. COLE, Representative on Electrical Committee of National Fire Protection Association, 11 Wareham Street, Boston, Mass.
J. E. LATTA, assistant secretary, 605 South Dearborn Street, Chicago, Ill.

Executive Committee:

EUGENE N. DAVIS, chairman, Brookline, Mass.

Frank R. Daniel, R. P. Strong, Henry A. Knight, C. H. Fletcher, Washington Devereux, James B. McCarthy, James H. Fenton, R. J. Forsyth, C. W. Mitchell, A. W. Hopkins, G. W. Perry, George L. Collison, T. H. Fritts, A. H. Soper, T. W. Bowry, F. G. Hartwell, A. A. Moffitt, Thomas D. McColl

Secretary's Message.

The secretary requests the members to pardon him if the amount of matter appearing in this issue is not large on account of the large amount of extra work entailed by the New York meeting.

The secretary desires to thank the members for the aid and support he has received from them and in the same breath demand more. His supply of questions is practically exhausted.

Please send him some at once; he knows well enough you have them up your sleeves, and must have them if the work is to be kept up to standard.

Lighting Control in Moving-Picture Theater.

Question 223. In the case of a small moving-picture establishment where there is but one general lighting circuit, should this be controlled from booth only, manager's office only, or from both by a three-way switch?

Answer 1 (B). The general lighting of a moving-picture establishment should not be under the absolute control of the operator in booth. In the earlier establishments in this city we have some cases where the operator in booth was able to throw out the lights by means of a shunt switch which became inoperative provided a main switch in proper location was open. When, however, this main switch was closed, switch in operator's booth became operative.

Answer 2 (D). It is not deemed good practice to have control switch for any of the house lights located in a motion-picture booth.

Answer 3 (O). The establishment described is in violation of Rule 38 *a*, which requires an independent service for emergency lighting. The emergency lights should be controlled only from the front of the house (Rule 38 *t*).

Answer 4 (E). There is no rule in the Code from which this question can be answered. Rule 39 should be followed in detail for an installation in a moving-picture theater.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Answer 5 (K). This is hardly a matter for the inspector to settle. Under Code Rule 38 t he can specify the sort of control which must be provided for exit lights and the lights in halls and corridors, but not that for the general auditorium lighting, which, it seems, is the kind of lighting on the circuit referred to in this question. We should recommend the adoption of control from both the booth and the manager's office, by means of two three-way switches, but we know of no Code rule under which we could insist upon it.

Answer 6 (F). See Rule 38, section *a*, National Electrical Code. Three-way switch control not required.

Answer 7 (P). I consider it quite important that both manager and operator be provided with means of turning on the house lights. Sudden additional illumination is very apt to allay an incipient panic.

Answer 8 (N). Control to some extent should be available at both places. A sudden light is often extremely desirable.

Answer 9 (J). In case it is desired to control the auditorium lights from the booth, as often happens, we raise no objection, but do require an additional control on the main floor at some point easily reached in emergency. We do not permit three-point switches, however; as a booth fire, by damaging switch or adjacent wiring, could prevent the switching on of lights from the other control point. Strictly independent control (for turning on these lights) is required of the lower or emergency switch and a pair of single or double-pole switches in multiple is installed.

Capacity of Feeders With Blank Circuits.

Question 224. How should one determine the allowable capacity for feeders and risers in a large building where blank circuits are left on the panel boards on the several floors and it is reasonable to expect that some of these will be filled in shortly after the building is occupied?

Answer 1 (O). The allowable capacity for wires is given under Rule 18. However, the questioner probably intends to ask how he should determine the size of the feeders, etc., under conditions mentioned. The answer is—he should not. The size of the feeders should be determined by the engineer in charge of the lay-out, and are usually based on the estimated load-factor of the installation. The inspector has nothing to do with the size of the feeders, except to see that the proper-size fuses are maintained.

Answer 2 (B). The allowable capacity for feeders and risers in a large building where blank circuits are left on the panelboards on the several floors should be based on the load for which the panelboards are designed to provide.

Answer 3 (K). The authority of the inspector would not extend to circuits which might possibly be installed after the inspection was made. He could insist upon proper fuse protection for the conductors in place when inspection was made, and anything beyond this would have to be in the nature of a recommendation only.

Answer 4 (F). The size of a feeder should be based on the number of branch circuits and the capacity of each connected to it.

Answer 5 (D). The feeder capacity for large buildings should be figured upon the total load, including contemplated additions, where same can be ascertained.

Answer 6 (E). While there is no rule in the Code to guide one to an answer to this question, I would suggest that provision be made for the entire load represented, by the live and blank circuits, in all of the panels.

Answer 7 (J). This is a matter that is not covered by present Code rules, and, it would seem, can only be handled by the inspector according to his ability in securing from the owner proper recognition of the wisdom of providing for future expansion. Of course, when the additional circuits are wired, the inspectors may then refuse to accept the work until proper feeder capacity has been provided. A tactful inspector should usually be able to convince the owner, if there is any ground for expecting the increased load.

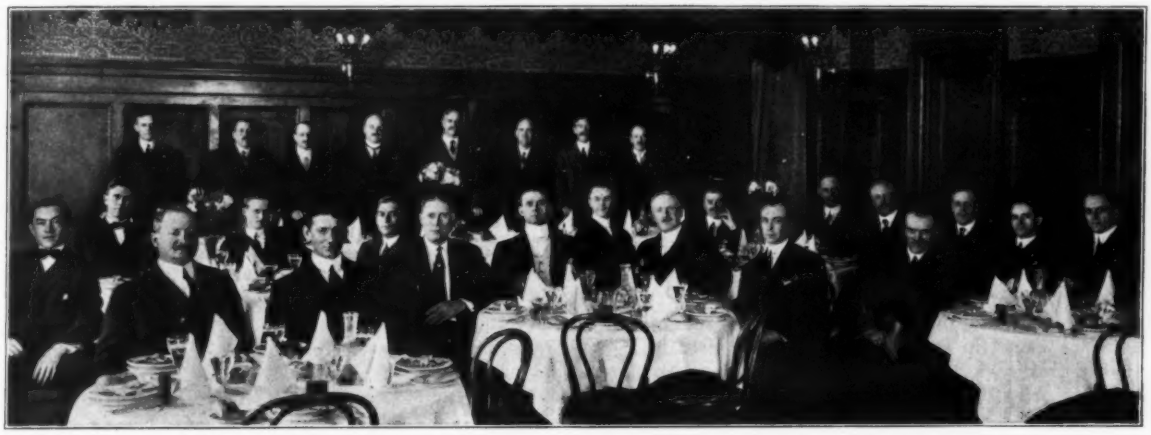
Answer 8 (P). In this territory, we would determine the capacity of a panelboard by multiplying the number of switches thereon by 660 (watts) even if some of the switches were not connected to circuits. This would result in securing a riser of ample size to care for the apparent needs of the prospective tenants. It is fair to assume that if the owner had not anticipated the need for these unconnected switches, he would not have provided them; and assuming the need to be probable, there is a very definite prospect that risers of less capacity than those above indicated would have to be reinforced—always a difficult job—before the ink on the certificate of approval had dried.

Answer 9 (N). This is purely an engineering question. All the inspector can do under the Code is to see that what is put in is properly fused, except in those occasional cases in small jurisdictions where local custom requires an unfortunate municipal inspector to act as an electrical "guide, philosopher and friend" to the citizens.

Answer 3 (F). Lamps in small closets should be treated as being exposed to mechanical injury and should be suspended from the ceiling on short lengths of flexible cord and the lamp equipped with an approved guard. Wall receptacles and rigid fixtures should not be used.

Answer 4 (K). There is no Code rule to cover this matter, but on the ceiling would be the best place for the lamp. If this was low, a wire guard should be supplied; otherwise it might not be necessary.

Answer 5 (B). The matter of an approved location for a lamp in clothes closet or packing closet would be controlled largely by local conditions. Speaking in general, without any special conditions, lamp should be on ceiling, and if the height of closet is such that it makes it advisable, should be protected by an approved guard.



Banquet of National Association of Electrical Inspectors, Hotel Flanders, New York City, March 25.

Answer 6 (O). There are several ways in which a lamp in such location should not be installed, assuming that the closet will be used for the storage of readily inflammable stuff. A key socket would be prohibited under Rule 31*c*. Ordinary flexible cord would be ruled out by Rule 32*d*. A lamp guard should be used, if necessary to protect a lamp and prevent its contact with combustible stuff.

Answer 7 (N). There is nothing in the Code to cover it, but under local regulation I have required a ceiling light. The question of a guard is largely a matter of size of closet and head room in the clear.

Answer 8 (J). In the ordinary bedroom clothes closet we have permitted lights on side walls, provided they were well above clothing hooks and

Location of Lamp in Clothes Closet.

Question 225. What do the members consider an approved location for a lamp in a clothes closet or packing closet? Should it be permitted under any condition on a side wall, and if on ceiling should it have a lamp guard?

Answer 1 (D). Lamps in clothes closets should be on receptacles mounted on ceiling and in case of small closets where the storage of articles might be close to the lamp, an approved guard should be required.

Answer 2 (E). Where it would be impossible for the lamp, under any circumstances, to come in contact with inflammable materials.

away from any shelving. Ceiling suspension is however preferred.

Answer 9 (P). Our experience teaches us that there is no place in a clothes closet other than the ceiling which furnishes a proper location for an electric lamp. Whether or not a lamp in such a location should be provided with a guard, depends entirely upon local conditions; as, for instance, the height of the ceiling and the proximity of shelving.

A New Water-Power Development.

At Dundee Falls, Me., on the Presumpscot River, a new power station for the S. D. Warren Company, paper manufacturers, is being erected under the general supervision of the Stone & Webster Engineering Corporation. The dam structure, about 1,400 feet long, is of earth, with the power house and spillway of reinforced concrete about in the center. The head to be utilized is 50 feet, with a wheel capacity of 4,500 horsepower. The concrete spillway is of the well known gravity suction type.

Power will be supplied by three 33-inch horizontal turbines of the S. Morgan Smith type, each capable of developing 1,500 horsepower at 277 revolutions per minute. They are of the wicket-gate type, the gates of each wheel being controlled by a Lombard governor. Each wheel is direct-connected to an 800-kilowatt General Electric generator operating three-phase at 60 cycles per second, at a pressure of 11,000 volts. In each case the exciter is on an extension of the generator shaft.

New York Section Meeting.

The next meeting of the New York Section of the Illuminating Engineering Society will be held on April 9 in the Engineering Societies Building. Two papers will be read at the meeting: one entitled "Light and Art," by M. Luckiesh; the other "Color Photography: An Examination of Screen Plates by Microscope and Spectroscope," by J. B. Taylor.

Banquet of New England Section.

The Executive Committee of the New England Section, National Electric Light Association, has decided to hold in place of the usual spring convention a banquet in conjunction with the Boston Edison Company Section. This will take place at the American House, Boston, Mass., on May 2, at 6:30 p. m.

Among the Supply Men

T. C. Ringgold, general sales manager of the Central Electric Company, writes as follows:

"The chief campaigns our organization is engaged in are not merely the buying and selling of electrical merchandise, but the more difficult and interesting task of buying right goods from right sources and selling them on a basis that permits the maximum of efficient service with a reasonable financial return and also allows adherence to correct progressive business ethics and principles, being guided always by the feeling that we owe a duty in a broad way to the electrical business as a whole, with the belief that we can best discharge that duty and its obligations by continuously working for the highest business ideals.

"This compels the observance of the financial and commercial precepts that have been established after long experience by the industries older than the electrical.

"To these sentiments and efforts we attribute largely the very satisfactory volume and profit we and many of our customers have been and are enjoying, and, actuated and inspired by these sentiments and results, we are directing much of our energy to the promotion and sale of Alexalites, and to Okonite insulated wires and cables.

"Other important factors in the economic distribution of light and power are of course receiving the attention they deserve.

"We had no sales meeting this year, preferring to have our men spend a week of liberty in our offices and warehouses, studying our system and getting acquainted with our office personnel.

"We are optimistic in respect to the future. We believe in the permanence and stability of the electrical jobbing and manufacturing business and will cheerfully stand back of our belief with all that we have of time and money."

David Killoch Company, 57 Murray Street, New York, has been appointed eastern agent for the F. W. Wakefield Brass Company, of Vermillion, O., manufacturers of electric fixtures.

W. L. Seaton, who has been connected with the Northern Electrical Company, Duluth, Minn., for the last 12 years, has left the company to engage in farming near Duluth. Mr. Seaton has been directly engaged in the electrical business of Minnesota for 25 or 30 years, and is well known to the electrical fraternity in that section. His friends and associates see him leave the field with great regret. He has been identified with it for a long time, has made a host of friends and acquaintances, and they all will wish him every success in his new venture.

The R. W. Hodge Electric Company, Kansas City, Mo., has opened its new sales rooms and offices at 806 Delaware Street. The showroom feature is a new one of the company. A large stock of counter goods, heating apparatus, automobile accessories and lighting fixtures has been put in, and this will also be a special feature. An advertising campaign for the stimulation of business locally has been started and it is expected that very satisfactory results will ensue.

The Commercial Electrical Supply Company, St. Louis, Mo., is conducting a special sales campaign on high grade Commercial wire-drawn tungsten lamps and Commercial farm lighting outfits. The company reports that central stations are buying construction material and lightning arresters. The sales manager of the company will shortly make a trip, attending all the state conventions occurring during April and May. The company has prepared a very attractive booklet entitled "Electric Light for the Farmer." This gives some very interesting information with regard to the Commercial lighting outfits and low-voltage equipment.

Alternating-Current Magnets.

In the course of a paper on "Alternating-Current Magnets," read before the Physical Society of London, E. Wilson said that it followed from the well-known law of pull of an electromagnet that if the magnetic field alternated between positive and negative values the pull was unidirectional and intermittent. Unless means were provided to reduce the consequent chattering and vibration, the magnet was rendered useless. In the present experiments a phase-splitting device had been adopted, and consisted in surrounding a portion of the pole-piece of the magnet with a short-circuited coil. The portion of the pole-piece so surrounded was sometimes said to be "shaded," and the coil referred to as a shading coil. The effect of this coil was to alter, not only the relative amplitudes, but the phase of the magnetic fields passing through the shaded and unshaded portions of the pole-face. The magnet used in the experiments varied the length of its gap when in action, and the influence of the gap length upon this phase-displacement had been studied. When the resistance of the shading coil was such that the magnetic induction over the whole face was substantially uniform and the gap closed, the phase-displacement was 72 electrical degrees. A gap length of 0.15 centimeter reduced the phase-displacement to 18 degrees, and consequently the minimum pull dropped. This minimum pull was, of course, smaller than the average, and had to be taken into consideration in the design of the magnet.

The arrangement of the shading coil above described was very effective in preventing vibration and chattering when the magnet was closed, and rendered the alternating-current magnet a practical success. With constant alternating voltage impressed upon the magnetizing coils of the magnet, the net pull exerted diminished rapidly at first as the gap length increased, and tended to become more nearly constant. The current steadily increased as the pull diminished, owing to the increase in the gap length.

The observed net pull in the case of the magnet experimented upon was less than the calculated average pull, varying from 83 to 59 per cent as the gap length varied from 0 to 1 centimeter.

Russian Copper Production.

The production of copper in Russia is materially increasing, the aggregate production during the first six months of 1912 amounting to 1,000,974 poods, against 709,109 poods for the corresponding period in 1911, the increase amounting to 41 per cent. The greater portion of the increase comes from the Ural, the figures for the two periods being respectively 550,900 poods and 364,935 poods—an increase of more than 50 per cent.

Public Service Commissions

CALIFORNIA.

A decision was rendered granting authority to the Pomona Valley Telephone & Telegraph Union to issue $100,000 of bonds. It proposes to use the proceeds to retire existing bonds and notes, and to extend and improve its system.

MASSACHUSETTS.

The Massachusetts Gas & Electric Light Commissioners have approved the issue, by the Harvard Gas & Electric Company, of 120 shares of new capital stock of the par value of $100, the proceeds to be applied to the payment of promissory notes outstanding March 1, 1913. The Massachusetts Railroad Commission has approved the issue, by the Berkshire Street Railway Company, of additional capital stock not to exceed 10,000 shares, amounting to $1,000,000 par value, the proceeds to be applied toward payment of the cost of building the Becket extension, in Western Massachusetts.

The Commission has also approved the issue, by the Athol & Orange Street Railway Company, of 905 shares of common stock at $100 per share, and 1,500 shares of six per cent preferred stock, the proceeds to be used in canceling indebtedness incurred in the purchase by the Company of the franchise and property of the Templeton Street Railway Company.

NEW YORK.

The Public Service Commission, Second District, has authorized the village of Hamilton to extend its electrical distribution system beyond its corporate limits into the town of Lebanon, Madison County, for the purpose of furnishing electric light to the hamlet of Randallsville.

OKLAHOMA.

The Oklahoma Corporation Commission in a case from Chickasha, which indirectly affects all of the larger Oklahoma cities, has placed its disapproval upon the employment of zones by telephone companies as a basis for fixture rates. The Commission in its order fixes the schedule of rates to be charged for all subscribers in Chickasha by the Pioneer Telephone Company, on and after April 5 as follows: business houses, $2.50; residences, $1.50; party lines, $1.00 per month. The Commission finds that the present residence rates vary from $1.00 to $1.75 per month and that this apparent discrimination is justified by the Pioneer Company on the ground that it has divided the city into zones, according to the distance of the subscriber from the central office. The Commission takes the position that zones should be disregarded and that charges should be the same in all parts of the city for the same service.

The Commission ordered the Central Oklahoma Telephone Company, which has an exchange at Okeene and gives long-distance service out of that town, to make physical connection with the Mutual Telephone Company, which also has an exchange in the same town. The Commission finds that owing to the fact that there are two exchanges in Okeene, most of the local subscribers, not desiring to keep up two telephones, ordered the instruments of the Central Oklahoma Company taken out, with the result that the latter company has practically no local business for which it receives pay, but conducts a long-distance business out of Okeene. F. F. Cressler and other residents of the town filed a petition with the Commission asking that they be given the benefit of this long-distance service from the stations of the Mutual company. The prayer was granted and the service ordered begun April 5.

Thirty Years Ago.

Electrical News of 1883 as Presented in the "Electrical Review," the Only Electrical Weekly Published in the United States at that Time—Third Installment.

(From "Electrical Review," N. Y., April 5, 1883.)

In Spain an installation of Gramme arc lamps is about to be made on the Barcelona and Tarragon Railways.

Experiments with electric lighting are being made on the trains on the railway between Brussels and Antwerp.

Sixty Edison lamps have been put up in a carpet factory in Helsingfors, Finland.

We note among our exchanges *The Electric Light*, a bright little eight-page monthly published by George R. Morse, of Rochester, N. Y.

On Friday, April 20, the New York Electrical Society will meet at the Stevens Institute of Technology, Hoboken, N. J., when Professor Henry Morton will address the meeting on "The Storage of Electricity."

At the International Exhibition to be held in Vienna this year there will be a pavilion specially constructed to show the effects produced by the electric light on draperies and embroidery. Different systems of electric light will be tested.

The municipal authorities of Moscow have voted a sum of 80,000 rubles for grand illuminations which will take place during the month of May. The citadel of the Kremlin, the ancient residence of the Czars, will be illuminated by 40 electric lights each of 400 candle-power.

Twenty-five Faure secondary batteries, charged from the "standard" dynamo, and connected with 40 of the Edison B incandescent lamps, were installed Wednesday at the Appleton Mills, Lowell. This is the first plant made by the Electric Storage & Light Company, Boston.

John A. Roebling's Sons Company recently sent from Trenton, N. J., to San Francisco, a wire rope one and one-half inches in diameter and over four miles long. It is for a cable street railroad in San Francisco, and it is claimed is the longest and heaviest wire rope ever made in the United States, weighing about 25 tons.

Mr. Leslie, the general superintendent in Washington of the Mutual Union Telegraph Company, has accepted the position of general manager of the Postal Telegraph Company, with headquarters in New York, and will soon enter upon his new duties. Mr. Leslie says that he shall advise from the start the policy of seeking entrance to cities under ground.

PROFESSOR FORBES'S ACCUMULATOR.—The Electric Carbon Storage, etc., Company, of Scotland, states that it is now able to supply these accumulators. We read that they have been very thoroughly tested and have given most excellent results. Whereas all other accumulators are of two and one-quarter volts electromotive force at most, these of Professor Forbes give generally two and one-half, and can be made to give two and three-quarter volts in practice, thereby effecting, as is well known, not only considerable economy in first cost, but also in working. Thus, according to the company's circular, 100 Forbes accumulators are equal to 125 of the ordinary kind in first cost and again in working.—*London Electrical Review.*

ANNUAL REPORT OF BELL TELEPHONE COMPANY. — We publish herewith a summary of the report of the American Bell Telephone Company, presented at its annual meeting held in Boston on the 28th ultimo. It was voted to increase the capital stock from $7,350,000 to $9,800,000 by the issue of one share of new stock for every three of old. The annual report of the directors was presented, and showed that there were under rental February 20, 1883, 244,711 instruments, a gain of 60,337 over 1882; exchanges in operation January 1, 1883, 735; subscribers, 97,735; miles of wire, 69,452; total earnings for year ending February 28, 1883, $1,576,031.57; expenses, $603,987.29; net earnings for the year, $972,044,28; dividends paid, $595,000; total assets, $11,952,152.31, of which $3,399,832.60 were valuation of patents.

Boston now deserves the name of possessing one of the finest working telephone exchanges in the country. The result is due in great part to the intelligent systematizing of G. L. Phillips, lately appointed assistant general manager of the American Bell Company, with headquarters at Chicago; the energetic business foresight of manager H. B. Lytle; and the almost sleepless vigilance and originality of W. D. McKinney, who came with Mr. Phillips from Dayton, O., a thorough operator with his eyes wide open. In rising to the position of superintendent recently, Mr. McKinney let his mantle fall upon a worthy successor in the manager of the operating department, John J. Carty, who fully sustains that trying and vital portion of the company's work. Probably 1,500 subscribers are now connected with this office, and from recent newspaper statements it would appear that more or less of the number are talking through a quarter of a mile or so of the Day and Phillips cables, which, as is well known to Boston people, have recently been laid in the underground tubes commenced last fall.

By "T. D. L.": "I read with much interest the compendious and intelligent report of Captain Greene upon the feasibility of placing electric light, telephone, and telegraph wires under ground. The report is, to do it justice, the most complete statement of the case that has ever been produced from the pen of any one *not an electrician* upon this most important subject; yet would it not have been more complete had an electrician of the highest rank been associated with Captain Greene in his investigations? * * * * A cable was laid on the Boston & Providence Railroad, and the experiments made there, while sufficiently encouraging to warrant further experiment, were not sufficiently so to enable any one to pronounce upon the effect of a similar system for commercial daily use. Retardation, which is not a cause but a result, and which will undoubtedly prove to be the worst enemy of subterranean telephony, depends upon the length and extent of surface of the wire, its proximity to the earth, and upon the nature of the insulating medium. Messrs. Preece and Sivewright state that one mile of subterranean wire will show as much retardation as 23 miles of the same-size wire suspended overhead. As a matter of fact there is no longer section of telephone wire now operated under ground than about

a quarter of a mile, and even with this short distance the articulation is manifestly defective, being of a sluggish and muffled character. One of the most necessary elements of a good working telephone wire is its ability to work well not only throughout its own limits, but also when connected with a much longer line, say, for example, one of 40 or 50 miles."

LEO DAFT ELECTRIC MOTOR.—The railroad at the Daft Electric Works, at Greenville, N. J., is about one-eighth of a mile in length. The electricity is generated by a powerful dynamo machine and is carried to the rails, through which it runs. The motor consists of a simple pair of trucks as a basis. Under a platform above the trucks the electrical appliances for regulating the motor are placed. By a small lever the motor is regulated in speed and the brake is put on. A grade of 40 degrees can be ascended. In regard to the cost of running the cars by electricity, Mr. Daft claimed that he could regain 75 per cent of the energy exerted from the steam engine in running the dynamo, and he could run the motors 40-per-cent more cheaply than by steam.

A NEW ELECTRICAL STREET CAR.—The electrical car tried at Kew Bridge is the last practical experiment undertaken by the Electrical Storage Company. The accumulators are placed under the seats, the current being communicated by insulated wire to a Siemens dynamo machine. This dynamo is made to act like a motor, and is connected with the axle of the wheel. Neatly set in the body of the car is an accumulator consisting of 50 Faure Sellon-Volckmar cells, each cell measuring 13 by 11 by 7 inches, and weighing about 80 pounds. The power of this accumulator is capable of supplying a constant motive power to the car for seven successive hours. The car, with the accumulators and machinery, weighs four and one-half tons, and when loaded with the 46 passengers which it is licensed to carry, there will be a total weight of one and three-quarter tons on each wheel. It has been computed that the daily cost of such a car, not including the first cost and wear and tear, is six shillings three pence, against twenty-six shillings, the daily cost of two horses. The measure of success which has been accorded to the inventor of this new electrical car is another proof, if proof were wanting, of the possibilities, of the storage battery.

Tuesday morning last at half-past five, the men on duty in the Edison lighting station at Pearl and Fulton Streets, startled the quiet of dawning by a wild cheer and cries of "Bully for the Laurence! She has done it this time if she never does it again." They were all grouped around an engine used for giving force to the dynamo-electric arrangement of armature and commutators which furnishes light to late workers, such as journalists in the lower part of town. The engine in question had performed the feat of running at a speed of 350 revolutions per minute for the space of 16 days and 16 hours without any cessation. The chief engineer, Mr. Vanderveer, said: "Mr. Edison was the first man to use high-speed stationary engines. He ordered from Armington & Sims, of Providence, R. I., an engine of 350 revolutions and of 175 horsepower. At first we had some difficulty in oiling certain parts liable to get heated and hard to come at, such as the crank pin of the balance wheel and the pin of the eccentric in the governing wheel; but I introduced a modification of the cup that catches the oil. Perhaps without this she could not have run for this length of time without stopping. Mr. Edison calculated that if she ran 16 days and 16 hours it would be equivalent to a run around the circumference of the globe, 24,000 miles. She is going at a rate equivalent to 60 miles an hour."

Brockton, 20 miles south of Boston, was one of the earliest places to adopt the telephone. The first lines were run in March, 1878; an exchange system was established in January following; a corporation took charge of the business in March, 1880, under a five-year contract; the spring of 1881 saw a 30-foot line completed to Boston, which proved to be one of the most reliable trunk routes in New England. Within the past fortnight the interest has passed to the Southern Massachusetts Telephone Company, presided over by C. W. Clifford, president; Samuel Ivers, treasurer; Moses E. Hatch, general manager, all of New Bedford. The telephone capitalists of Massachusetts are wdie awake to the advantage of consolidated interests in other sections. Aside from the recent purchase of Minnesota and the Northwestern Company by the Lowell Syndicate, H. B. Lytle, A. P. Sawyer and G. W. Piper, late owners of the Brockton property, are among those who lately obtained a controlling interest in the Washington, D. C., organization.

W. J. Jenks, who was the promoter and manager of the Brockton company, resigned March 1, to accept the management of the Edison Electric Illuminating Company, of Brockton.

The historic town of Plymouth was one of the first to introduce the telephone, and a circuit of perhaps a half dozen stations for social purposes, is now in operation. Until a short time ago it was equipped with original wooden receivers, which few of the young managers of today have ever seen. No Blake transmitters have yet been introduced. A line will be built this season connecting with Brockton, and thence with Boston.

By P. H. Van der Weyde, M. D.: "That the electric light is the nearest approach to sunlight is also proved by its successful use in photography, which is now in operation in New York City, making the photographer independent of the variations in daylight. This fact induced the son of the writer of this article, Major Henri Van der Weyde, who is a portrit painter, to establish, some years ago, a photographing establishment at No. 182 Regent Street, London, where only electric light is used for all operations, without exception, making him the pioneer in artistic electro-photography. Thanks to his eminent success he became the court photographer. * * * It appears that the known methods which science has furnished for economical light production from a given amount of fuel, the electric light stands foremost, and that, notwithstanding the apparent complication of the machinery between the furnace where the fuel is burned and the illuminating carbons of the arc light, or incandescent lamp, it is the most practical method thus far invented for the production of intense illumination."

Some Electrical Patents Issued in 1883.

March 20:

Apparatus for substituting gas for electric light, Patrick B. Delany, New York.

Cutout for dangerous electric currents, Frederick A. Swan, and Charles B. Bosworth, Boston.

Dynamo telegraphy, Henry Van Hoevenburg, Elizabeth, N. J.

Electric lamp, incandescing electric lamp, incandescent electric lamp, manufacture of incandescents, system of electric distribution, secondary battery. Thomas A. Edison, Menlo Park, N. J.

Electric clock, Vitalis Himmer, New York.

Electric telephone transmitter, receiving telephone, Thomas A. Moloney, Washington, D. C.

Electric current regulator, electric arc lamp, Charles G. Perkins, Camden, N. J.

Electric arc lamp, Elihu Thomson, New Britain, Conn.

Incandescent lamp holder, Edward Weston, Newark, N. J.

Printing telegraph, Stephen D. Field, New York.

Telegraph apparatus, Georges D'Infreville.

Underground conduit for electrical conductors, Henry Robert Meyer, Liverpool, England.

(*Quotations from* ELECTRICAL REVIEW *of April 12, 1883, will appear next week.*)

ON THE DEVIATION FROM LAMBERT'S COSINE LAW OF THE EMISSION FROM TUNGSTEN AND CARBON AT GLOWING TEMPERATURES.[1]

By A. G. Worthing.[2]

Lambert's cosine law as applied to the radiation from a self-luminous body is expressed by the following equations:

$$b = dI/dS \cos e = b_o$$

where b, dI and dS refer respectively to the brightness, the luminous intensity, and the area of an element of the body when viewed by light emitted at an angle e, and where b_o is the brightness viewed normally. Thus where the cosine law holds, the brightness does not vary with the angle of emission. Möller, Provostaye and Desains, Violle, Milliken and Uljamin have particularly investigated this relation. With the exception of Möller, who concluded that the law held for platinum, the methods have been indirect and based for the most part on measurements of polarization. In a study of the energy losses in electric incandescent lamps,

Fig. 1.—Diagram of Apparatus.

in collaboration with Hyde and Cady, the writer noted certain variations which have led to the investigation described in the present paper.

Apparatus and Method.

The arrangement of the apparatus is shown in Fig. 1. The materials used were large cylindrical lamp filaments mounted in spherical bulbs, the portions used being those near the centers of the bulbs. A represents such a lamp, B a lens so placed as to produce an enlarged image of the filament of A in the plane of a thin filament mounted in another bulb at C, D a telescope, and E a piece of red or of blue glass. The transmissions of the glasses used are such that the lights transmitted may for computational purposes be considered monochromatic, the wavelengths being 0.63 and 0.46 microns. F represents an absorbing glass screen which, though not regularly used, was used in the special case when the effect of changes in temperature was investigated.

One method of manipulating lamp A consists in rotating it about a vertical axis passing through the point investigated. Another method consists in raising or lowering lamp A so that successively different portions of a cross section of A are seen in line with the filament C. In either case the method as a whole is purely an optical-pyrometric one. It consists in finding for various angles of emission for the light from lamp A, the various voltages of lamp C at which it matches in brightness, as seen at E, the portions of the image of lamp A which are in close juxtaposition. From such data one may obtain the variations in brightness of lamp A with angle of emission by determining the relative intensities of lamp C for the red or blue light of the desired wavelengths for the different voltages obtained.

1 Abstract of paper presented before the American Physical Society in April, 1912. The complete paper has been published in *Astrophysical Journal*, 36, page 345; 1912.

2 Physical Laboratory, National Electric Lamp Association.

of zero and of 75 degrees for a low operating temperature, and then with an absorbing glass screen at F for a high operating temperature such that in the second instance the voltages for lamp C were approximately the same as those for the first instance. The two readings at 75 degrees were made successively without any other change than the introduction or the removal of glass F.

Results.

For approximately monochromatic lights of wave-lengths, 0.63 and 0.46 microns, determinations were made of the brightness as a function of the angle of emission for tungsten at a temperature corresponding to the normal operating temperature with a consumption of 1.25 watts per candle (Fig. 3)

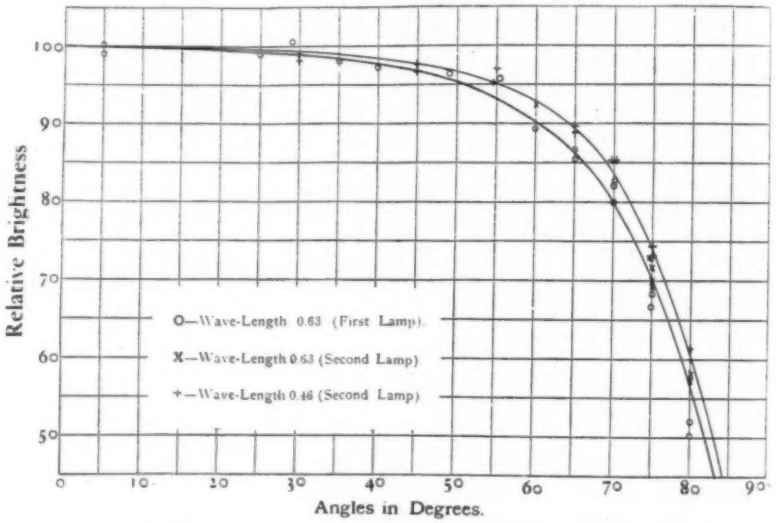


Fig. 2.—Deviation from Lambert's Law of Emission from Carbon.

The question of a change in the variation from the cosine law with temperature was especially suggested by a paper by Hyde. In order to make certain whether such a change existed or not, voltage readings of lamp C were taken in the ordinary way for angles of emission from lamp A and for carbon at a temperature corresponding to normal operation of carbon lamps (Fig. 2). In addition the tungsten lamp was investigated at a temperature corresponding to a wattage of about 18 per cent of the normal.

In the investigation of the effect of

TABLE I.

Computed and observed brightnesses and polarizations of tungsten and of carbon as functions of the angles of emission. The computed values are for a wave-length of 0.579 microns, the observed for 0.63.

Angle Degrees	Reflectivity	Relative Brightness Computed	Relative Brightness Observed	Polarizations Computed	Polarizations Observed
		Tungsten.			
0	0.486	1.000	1.000	0.000	.....
15	0.486	1.000	1.002	0.022	.....
30	0.485	1.002	1.011	0.093	.....
45	0.484	1.004	1.03	0.220	0.156
60	0.478	1.015	1.08	0.411	0.285
75	0.497	0.978	1.16	0.655	0.458
80	0.542	0.891	1.15	0.737	0.520
85	0.664	0.654	1.08	0.813	0.585
90	1.000	0.000	....	0.875	.....
		Carbon.			
0	0.367	1.000	1.000	0.000	.....
15	0.366	1.001	0.996	0.020	.....
30	0.366	1.002	0.989	0.082	0.022
45	0.368	0.998	0.968	0.196	0.054
60	0.374	0.989	0.906	0.370	0.096
70	0.390	0.964	0.80	0.511	0.127
75	0.425	0.908	0.70	0.603	0.144
80	0.486	0.812	0.58	0.689	0.160
85	0.636	0.522	....	0.774	.....

temperature on the variations, seven sets of determinations showed that for red light tungsten does change with temperature. The average of these gave for an emission angle of 75 degrees, an increase in the deviation from the cosine law with the increased temperature amounting to 22 per cent, with an average variation from it of 5 per cent.

The making of brightness determinations is difficult for large angles of emission. By making use of U-shaped filament, this decrease in brightness for large angles may be readily observed if the filament is so rotated about a central vertical axis that the two limbs are nearly in the line of sight. A fairly large portion of the lower curved portion emitting light at a large angle will then be found in close juxtaposition to fairly large areas emitting light at smaller angles of emission. In Fig. 4 there have been platted the brightnesses of cylindrical glowing filaments of tungsten and carbon at normal operating temperatures as functions of the apparent distances from the central axis when viewed at a distance.

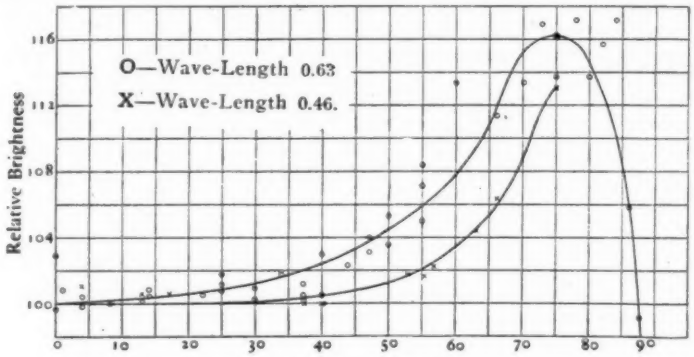


Fig. 3.—Deviation from Lambert's Law of Emission from Tungsten.

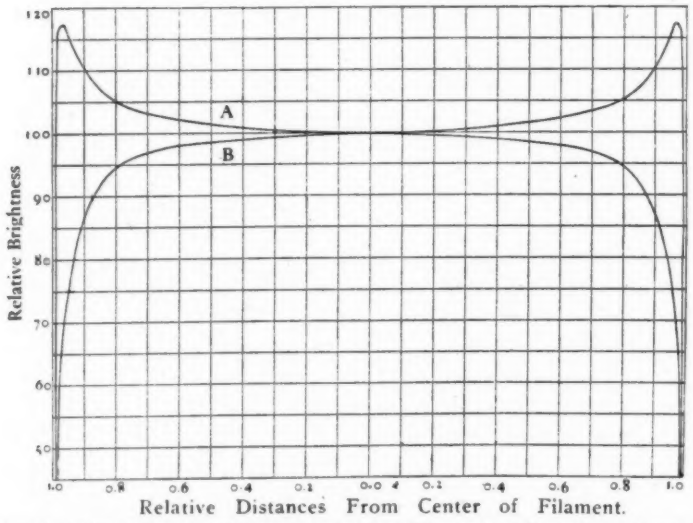


Fig. 4.—Variation in Brightness Across Cylindrical Filaments of Tungsten (A) and Carbon (B) as Viewed from a Distance.

It is interesting to compare the experimental results with what may be obtained by computation, making use of the optical constants obtained by H. v. Wartenberg with the aid of certain electromagnetic formulas given by Drude. Such computed and observed results are given in the first seven columns of Table I.

The variation between the computed and the observed results on brightness lend interest to some polarization tests. By means of a lens an enlarged image of the filament investigated was formed on a piece of ground glass just in front of a Marten's polarization photometer. By manipulating the lamp as before, the polarization of the light emitted at various angles could be investigated. The variations due to using lights of different wave-lengths were found negligible. Most of the measurements were made with the integral light from the source. The computed and observed values are given in the last two columns of Table I.

Discussion of Results.

As sources for the discrepancies between the computed and the observed results, there appear at least five facts to be considered.

(1) The computed results are based on determinations made with light of wave-length, 0.579 microns, while the observed data are for light of wave-lengths approximately 0.63 and 0.46 microns.

(2) The results of Wartenberg were obtained for materials at ordinary temperatures, while the writer's were obtained with the materials at incandescent temperatures.

(3) The existence of a temperature-gradient in the incandescent filament.

(4) The roughness of the filament surface.

(5) The existence of an anisotropic surface layer.

In general it may be said that the second and the fifth sources are the most promising in explaining discrepancies. The fourth source, while tending to explain the polarization results, acts in the wrong direction on the brightness discrepancies. The first and third sources are ineffective in explaining anything.

The present work seems to have a direct bearing on certain conclusions which have been reached by others. Hyde has found that a tungsten-carbon combination does not satisfy his first criterion, and that therefore, taking one as a standard, the other changes in its optical properties on being heated. Although good reasons were advanced for thinking that the change occurred in the tungsten, they were not conclusive. The present work indicates definitely a change with temperature in the optical properties of tungsten. No change has been found for carbon. The greater deviation from Lambert's law for the light of the longer wave-length for tungsten is in perfect accord with the known pronounced emission selectivity for the shorter wave-lengths and the measured reflectivities of Coblentz. The greater emissivity for the blue light would suggest that for the shorter wave-length the approach to black-body radiation is more nearly complete, that consequently there would be a closer approach to Lambert's law, as is the case. Starting with the close agreement of the blue and red deviations of carbon from Lambert's law, one is led to the conclusion that it behaves like a gray body. The small variation which has been found agrees in direction with the small variation which Coblentz found in the reflectivities. That it approximates closely a gray body is generally accepted.

Summary.

(1) The brightness of tungsten beginning with normal emission increases with the angle of emission, reaches a maximum at about 75 degrees and for somewhat larger angles decreases rap-

idly. The brightness of carbon beginning with normal emission, decreases with increasing angle of emission, the rate of decrease increasing with the angle.

(2) The relative brightness variations for light of short wave-length (0.46 microns) for tungsten are noticeably less than those for the light of the longer wave-length (0.63). The same effect is true for carbon, though the difference is less noticeable.

(3) The relative brightness variations for tungsten at the higher of the two temperatures chosen is about 20 or 25 per cent greater than the corresponding variations for the lower temperature. No definite change with temperature was found for carbon.

(4) The average brightness of a tungsten cylindrical filament as viewed normally to its axis from a distance is found to be about 3 per cent greater than that of the central part, that for a carbon filament about 5 per cent less.

(5) A comparison of the observed with the theoretically computed values for both tungsten and carbon shows the observed deviations from Lambert's law to be greater than and of a different order of magnitude from the computed.

(6) The observed polarizations of the emitted light have been found practically independent of changes in temperature and to be considerably less in magnitude than the computed values.

(7) While the above discrepancies have not been explained, in certain respects the present results have been found to agree qualitatively with the experimental results of Hyde and of Coblentz.

Chicago Electric Vehicle Meeting.

At the regular weekly meeting of the Chicago Section of the Electric Vehicle Association, which was held on April 1, an interesting discussion took place regarding the whole electric-wagon situation in Chicago. The speaker of the day, Uri B. Grannis, of the Borland-Grannis Company, was unfortunately unable to be present on account of the floods in Ohio and Indiana.

George H. Jones, chairman of the Section, made the announcement, in opening the meeting, that the 1913 convention of the Electric Vehicle Association of America will be held in Chicago. It will probably take place about November 1.

Speaking of the poor care that trucks sometimes receive at the hands of the inexperienced garage attendants, Mr. Salvat, of the Fashion Garage, again brought up the desirability of having a school at which men with some experience in the care of electric batteries and vehicles could be given thorough and exact instruction. Representatives of several battery-manufacturing companies signified their willingness and desire to help in any such movement, and it seems probable that something in this line of educational work will be done at a not distant date.

Attention was brought vividly to the fact that a great many garages discourage any proposition to take care of trucks. One of the most common reasons is that some people, especially ladies, owning pleasure vehicles, do not like to have them on the same floor with heavy commercial wagons. As one speaker expressed it, they feel that their vehicles are in bad company.

Mr. Witherbee, of the General Vehicle Company, brought out the fact that hardly any of the garages in Chicago are equipped to handle the current necessary for a heavy wagon. A great many of them are limited to 20 or 25 amperes. It is very important to provide for several hundred amperes to take care of wagons which are equipped with batteries taking heavier current, such as the Edison A 12. This battery normally takes 90 amperes. and for a short charge would need nearly three times that amount. This short-time high-current charge is only required where the vehicle runs in for a short noon boost.

The business of the meeting included the naming of the Nomination Committee, on which are Messrs. Witherbee, Whipple, and Frayer. The annual banquet of the Section, it was announced, will take place on Tuesday evening, May 6.

Meeting of the New York Electrical Society.

On March 28, C. F. Lacombe, chief engineer of light and power, Department of Water Supply, Gas and Electricity of New York City, lectured before the New York Electrical Society on "The Street Lighting and Fixtures of New York City." Illustrating the subject with a large number of slides, Mr. Lacombe gave a most interesting description of the way in which the street lighting of New York had been developed from crude beginnings to the wonderful era of illumination which is now giving such splendid promise. The development of fixtures has kept pace with that of lighting, and many of the recently designed poles shown on the screen were things of beauty.

In conclusion Mr. Lacombe said: "The engineer should not cling too closely to the most efficient and economical devices which obtain only the greatest illumination at the lowest cost, for the lighting must be made agreeable to the eye. In street lighting, unless surrounding buildings are to be specially illuminated, the useful rays are those that can be directed towards the ground. To make this agreeable, the point source of an arc lamp, for instance, must be made into a ball of softened light by diffusing globes or shades, and this, so far as is possible, thrown towards the ground by either interior or exterior reflectors. This loses efficiency to a certain amount, by the absorption of the light, and demands either closer spacing or more powerful sources of illumination at greater heights from the ground. It is consequently more expensive. So far, it has been used mainly in Manhattan, and there, principally on its main avenues.

"In other locations, we approach nearer to the naked source of the light. This, in turn, means glare and is not as agreeable, although very useful and less expensive. Considerable success in suburban sections of the city has also been attained by abandoning the intense arc unit and using three or four 60-candlepower tungsten lamps, and so obtaining better distribution, with less glare, and at about the same cost.

"It is towards aiding the extension of diffused lighting in sufficient amount that the efforts of all should be devoted. The administration, the company, the citizen, the artist, and the engineer should all work to this end. The progress of this lighting depends on the aid the other factors in this work give the engineers in charge.

"The further development of both the tungsten and flaming arc lamp is now an assured fact, and it is with these two main units that we hope to work out the further illumination of the city. In addition to these, magnetite lamps can be used in districts where series arc lighting is in vogue. By far the greater territory in the city will be covered for a long time to come, however, with our old standby—the standard inclosed carbon arc lamp—and the mantle gas lamp with either upright or inverted mantles. It is believed that with these illuminating units and the use of the same care in the future to follow the system described to you, on the general scheme of illumination, that the lighting of the city can go forward as rapidly as desired, within the physical and financial limitations, and in due time will become not only an attractively lighted city, but the best lighted city in the world."

Francis Wiley Jones, the first president of the Society, was elected an honorary member of the Society.

Exports of copper for the first twenty-seven days of March, amounting to 13,578 tons, were the largest on record, showing an increase of 480 tons over December, 1911, the largest previous record.

The Electric Propulsion of Ships.

One of the most remarkable features of the engineering process of the last few years has been the almost instant technical and commercial success of revolutionary departures from previous practice. We may instance the adoption of the marine turbine, of mechanical gearing between the engine and propeller of a ship, and of the Diesel engine for marine work. These cases are very striking, since we think it safe to say that successful engineering methods and applications are as a rule built up on extended experience. This is as one would expect. A revolutionary change can in general only attain a position of standing after it has been employed by many different people in many different circumstances, and over a fair period of time.

When we come to cases of new proposals which are not able to make any very striking claims, or against which there appear to be serious arguments, it will in general be found that very many years are required befor it is possible for their sponsors to introduce them on such a scale that they can come to a position of any standing. The adoption of some form of electric gearing between the engines and propellers of a ship appears a good example of this class of case. The proposal is not very new. It was in practical operation at least as early as 1903, when the Société Nobel Fréres, of St. Petersburg, had an oil-tank ship of 1,100 tons fitted with an electrical transmission, in service on the Volga and Caspian Sea. Since that time a good deal has been done, mostly with small boats, and yet the scheme has not attained such a position that it is even seriously considered by the majority of engineers. We think the trouble has been not so much that believers in electrical transmission have not been able to put forward reasonable arguments, as that the objections, real or imaginary, against putting an electrical main transmission on an ocean-going ship have not been met by practical demonstrations. Until there is a fair amount of practical evidence that such main transmissions are unobjectionable, it is very unlikely that the majority of shipping people will be prepared to give them any considerable attention.

It may be a somewhat hard saying that electrical transmission cannot attain a position of standing until it has come into use on a fairly large scale, but its truth appears to us obvious. It is well to remember, however, that by a position of standing we mean that the system shall be of such unquestioned practicability that it will be considered to be in no sense experimental. The believers in electrical transmission have apparently, up to quite a recent date, been unable to persuade anyone to experiment with their system on a reasonably large scale, so that up to today there is absolutely no practical evidence with which one can rebut arguments to the effect that main electrical transmission is unsuitable for ocean ships. The completion of the United States Collier *Jupiter*, and of the *Diesel* electric ship which is being built by Swan, Hunter and Wigham Richardson, may do something toward building up such evidence; but it is well to remember that these two ships in themselves cannot prove the case for any general adoption of marine electric transmission. If they are successful over a number of years, they will do much toward making a case for such transmission, but in no circumstances will the limited experience of two ships be competent to establish a case for the general adoption of the system. If the ships are sufficiently successful, they will naturally lead to the building of others, which in their turn will help towards the establishment of the general case.

Much argument has been advanced by the electric-ship people to build up their position. Such argument is, of course, allowable and necessary, but it appears to us that progress can be made in this matter only by practical demonstration—practical demonstration, not on a small scale, but a large. Early in 1911 Mr. Mavor equipped a small boat with his electrical transmission gear, in order to demonstrate its practicability. As far as we know, the experiment was quite successful, but it is not clear that anyone even supposed that it would not be. We are not criticising Mr. Mavor's action. He naturally improved the likelihood of his apparatus being taken up by showing it in practical operation. Our point is, however, that electric transmission is not delayed because people suppose that it will not work, or even that people suppose that it will not show better efficiency than existing methods. It is delayed because people are not convinced that it is suitable for the everyday work of a marine engine-room. They are not convinced that it will be able, day in and day out, to stand up to the hard conditions, the damp atmosphere, and possibly the flooded engine-room of a ship in a heavy gale for days together.

A disadvantage under which the electric-transmission advocates labor is that their proposals are able to make a much better case for adoption on warships than on merchant vessels. The splitting up of the prime mover in such a way that half speed may be maintained with the same efficiency as full speed is of little interest in connection with either passenger or tramp ships. For warships, however, the matter is important. In a sense, it may be said that it is an advantage to electric-transmission advocates that they can put forward a good case for warships, since Governments in general have access to funds of a magnitude unapproached by those of private firms, so that if it is considered worth while there is plenty of money available for experimental installations. This advantage is, however, quite outweighed by the disadvantage—from the electric-transmission point of view—that warships are the last place on which untried and doubtful appliances are wanted. The reliability of the propelling machinery of a battleship is of such importance that there would be no justification for building an electrically propelled battleship unless the system had proved its case quite definitely in other spheres. It will be remembered that even now there are some who hold that steam-turbines are not yet of sufficiently proved reliability to be suited for installation in battleships.

There is no doubt that the building of the Jupiter and the Swan-Hunter ship form much the most important steps which have been taken in connection with electric transmission. When these ships are running, we shall have the beginning of a body of evidence bearing on the behavior of electric transmission in practice. This evidence may or may not help to establish the suitability of the system for use on a large scale. In any case, it will help to clear the air, and will do something towards settling the main question involved, which is, whether electrical machinery is, or is not, suitable for driving the propellers of ships engaged in world-wide trade and subjected to all the conditions of climate and weather which such trade involves. —*Engineering.*

To Communicate Across Bering Sea.

Arrangements are being made for the establishment of regular wireless service across Bering Sea, between the American and Russian Governments, which will insure telegraphic communication between America and Asia at all times, even in the event of the interruption of the cable service. The projected service, taken in connection with the existing transatlantic radio service, completes the circuit of the globe by means of wireless communication.

The total copper production in the State of Washington in 1912 was about 1,250,000 pounds.

Sampling Coal for Tests.

In a publication of the Bureau of Mines, George S. Pope, engineer in charge of sampling and testing of coal deliveries, for which the United States Government pays upon a heat-unit basis makes the following statements in regard to sampling the coal.

To determine with utmost accuracy the ash content and heating value of a quantity of delivered coal would require the burning of the entire quantity, and special apparatus arranged to measure the total heat liberated, or would require crushing the whole quantity, and reducing it by an elaborate scheme of successive crushings, mixings, and fractional selections to proportions weighing approximately one gram, the minute quantity which the chemist requires for each determination. Either of these procedures is obviously impracticable if the coal is to be used for the production of heat and power.

The method employed is to select proportions from all parts of a consignment of coal and to systematically reduce the gross sample, obtained by mixing these portions to quantities that the chemist requires for making ash determinations or that can be burned conveniently in the calorimeter, an apparatus for determining the heating value. The gross sample should be so large that the chance admixture of pieces of slate, bone coal, pyrite, or other impurities in an otherwise representative sample will affect but slightly the final results. Increasing the size of the gross sample tends toward accuracy, but the possible increase is limited by the cost of collection and reduction. In reducing the gross sample by successive crushings and fractional selections, the object is to procure a small laboratory sample that, upon analysis, will give approximately the same results as the gross sample itself, or, in fact, the entire quantity of coal from which the gross sample was obtained.

Recognizing the importance of the method of sampling as being a definite commercial procedure and of having the method clearly set forth in the specifications to become a part of the contract, and recognizing also the desirability of insuring uniformity and similarity in the specifications used by the different branches of the federal service for the purchase of coal, representatives of the executive departments and independent establishments of the Government held a conference under the auspices of the Bureau of Mines in February, 1912, for the purpose of discussing these and other features of the specifications. At this conference committees were appointed to prepare specifications in accordance with the views of the members. It was recognized at the conference that in general specifications, such as were recommended, certain requirements had to be of wide application, as the specifications cover such a wide variety of conditions, not only as to character and quality of coal but as to type of furnace equipment, size of deliveries, methods of delivering, etc.

The specifications which were used for the purchase of coal on the heat-unit basis prior to the fiscal year 1912-13 were on the "as-received" basis; that is, payment for delivered coal was directly affected by the moisture content of the sample received by the laboratory. This method was based on the assumption that the moisture in the samples collected at the time of weighing and delivery could be preserved with slight loss during the storing and subsequent working down of the gross sample to a quantity convenient for transmittal to the laboratory and in its later treatment in the laboratory. From experiments that have been made and from a large mass of data, it is known that the moisture content of coal does not remain constant, and that the moisture content reported by the laboratory may be as much as 5 to 10 per cent lower than that actually contained in excessively wet or high-moisture coal at the time of weighing.

As a sample loses moisture, its heating value correspondingly rises, with the result that the price for delivered coal determined on the "as-received" value is, with rare exceptions, higher than that warranted by the quality of the coal at the time of weighing. As a general statement, payment based on the "as-received" heating value will be higher than warranted, unless the sampling and laboratory work can be carried on under conditions that minimize moisture loss, as under freezing temperatures.

Recognizing the uncertainty involved in taking the moisture determination in the laboratory as representative of the moisture content of the delivered coal, and the consequent possibility of payment of a higher price than is warranted, the Bureau of Mines recommended to the executive departments and independent establishments of the federal service that the heating value in the coal specifications for the fiscal year 1912-13 be on the "dry-coal" basis.

In preparing these specifications the fact was recognized that the amount of moisture contained in coal produced from day to day from the same mine, or group of mines working the same bed, is largely accidental, and is a matter over which the buyer and seller have only slight control. However, in order to place a negative value on high-moisture coals and to protect the Government against the delivery of coals containing excessive amounts of moisture, the specifications require the bidders to specify the maximum moisture content in coal offered. This value becomes the standard of the contract.

If coal of uniform "dry-coal" heating value is delivered on a contract, the contractor receives the advantage on any delivery in which the moisture content approaches the maximum specified, because he is paid for the weight of water contained in the coal in excess of a normal amount, whereas if the coal is very dry, containing less than the normal amount of moisture, the purchaser receives the advantage.

As an example of the effect of a heavy rain on a car of coal in transit, a precipitation of 3 inches of water on a loaded 50-ton car, area of top about 360 square feet, would increase the weight of the coal 5.01 per cent, provided none of the water drained out or evaporated. It is obvious that if this coal is weighed and delivered immediately, special samples for moisture determinations should be collected and prepared at once and sent to the laboratory, as a basis for equitable adjustment of payment on account of the excessive amount of water in the coal. As the weight of the coal was increased by the excess water, there should be a corresponding decrease in the price to be paid.

If a railroad car or wagon so rained on should not be unloaded immediately after weighing and special moisture samples should not be properly collected, prepared, and sent hermetically sealed to the laboratory, it is obvious that the purchaser would pay a higher price than warranted, especially if the car or wagon stood for some time before sampling and some of the water drained out. Further if the coal was not immediately unloaded and sampled or if the car continued in transit after weighing, then the coal at the top would soon dry; and in either case the effect of the three-inch rainfall, as indicated by the analysis, might be only a fractional percentage of the moisture contained in the coal at the time of weighing.

The determination of the moisture of coal delivered from stock piles is often of great importance, for the proportion of moisture contained in the small sizes, which are most abundant near the center of a stock pile and which absorb the rains and melting snows may be from 10 to 15 per cent higher than when stocked. It is apparent, therefore, that special moisture-sample determinations are necessary for equitable adjustment of payment on account of excessive moisture in coal which is stocked in piles exposed to the weather.

The specifications provide for the collection of "special moisture samples" if, in the opinion of the Government officials sampling it, the delivery contains moisture in excess of that guaranteed by the contractor. The "special moisture samples" are prepared in a manner to minimize moisture losses and may be taken and prepared independently of the gross samples collected for the determinations of heating value, ash, and other specified data. If the analysis of the special sample shows a moisture content in excess of the contractor's guaranty, a proportionate deduction is made from the price to be paid for the coal.

Safeguarding the Supply.

A Greenfield (Mass.) factory solved the problem of introducing electric power service without adding to the fire or accident hazard by placing its transformers and meters inside the small concrete structure shown in the accompanying illustration, and distributing service to the various depart-

Transformer House.

ments on a strictly low-voltage basis. In this case the 2,300-volt power lines were kept entirely out of the main shop, and the principal oil switches and fuses were all placed inside the concrete building. Special care was also taken to keep the lines entering the transformer house free from rain and sleet by the bending of drip loops whose shadows can be seen in the illustration. At one side of the structure a large hole was left in the concrete wall to permit the escape of oil in case of overflow from the transformer cases. A space of about four feet was allowed between the transformer house and the shop proper, underground cables carrying the current into the building for the lamp and motor service. Directly inside the shop a special locked room was set apart for meters and low-tension switches, and keys furnished only to one or two responsible employees. Conduit wiring added the last factor of safety to the shop service. The transformer house was located on a side hill in an unused corner of the shop yard.

BOOK REVIEWS.

"The Theory of Engineering Drawing." By Alphonse A. Adler. New York: D. Van Nostrand Company. Cloth, 312 pages (5¾x8¾ inches), illustrated. Supplied by the Electrical Review Publishing Company, for $2.00.

The author has chosen for the title of this work "Theory of Engineering Drawing," believing that it indicates better than could any other, the ultimate purpose of the book. The subject matter is a treatise on descriptive geometry. A novel feature in the treatment is the order of presentation. Definitions and the theory of point and line projection are left for presentation until the fifth chapter. Chapters I to IV inclusive are devoted to oblique, orthographic and axonometric projection. The author arouses the student's interest and gives him a better grasp of the subject by presenting to him some concrete objects projected in these various ways. The treatment of the theoretical portion is very elaborate in detail and the illustrations are particularly clear. The initial paragraphs under each topic are numbered in a way to facilitate cross references and assignments. Numerous questions and problems are at the end of each chapter. The work is a notable addition to those on descriptive geometry.

HORACE P. FRY.

"A Laboratory Manual of Physics and Applied Electricity." Vol. I. Arranged and edited by Edward L. Nichols; revised and rewritten by Ernest Blaker. New York: The Macmillan Company. Cloth, 417 pages (5¾x8½ inches), illustrated. Supplied by the Electrical Review Publishing Company for $3.00.

The first edition of this book appeared in 1894, and the fact that it has been in use so long without a revision until now, is evidence of the excellence with which it was prepared in the first place. It was designed especially for use by the juniors in the engineering courses in Cornell University, and was accordingly of rather more advanced type than those laboratory manuals designed for use in an earlier part of the student's course. A manual of this type may serve not only to furnish directions to students for a prescribed course of experiments, but also as a reference book on physical laboratory determinations in general; but the accomplishment of the latter purpose requires the inclusion of a greater number of experiments than can usually be carried out by students in the time allotted to their physical laboratory course. Nichols's Manual accordingly, included a good many more experiments than the students were expected to perform in their regular laboratory course; but the plan was devised of arranging the experiments in groups, and requiring the student to choose one or more experiments from each group.

The revised edition, which is the subject of this review, preserves the same general plan as the original edition. A few (8) of the experiments of the original edition have been omitted, and a good many new ones have been added, among which may be mentioned those on the planimeter, the potentiometer, the calibration of ammeters and voltmeters, the determination of inductance, the magnetic properties of iron, and several on photometry. A brief set of physical tables has been added. The size of the book has been increased from 294 pages to 417. The typographical work is excellent, and the book is well supplied with diagrams and illustrations, which are admirably clear, although usually on a small scale.

J. R. BENTON.

"Light, Photometry and Illumination." By William E. Barrows, Jr. New York: McGraw-Hill Book Company. Cloth, 335 pages (6⅛x9⅛ inches) with 196 illustrations. Supplied by Electrical Review Publishing Company for $3.00.

In his introductory preface Professor Barrows says that the aim of this book is to serve as a textbook in illuminating engineering and as a reference to the practicing engineer. The text and style bear this out, particularly as to the use of the book by students.

In agreement with its title the volume may be divided into three parts. The first five chapters deal with light and those of its physical properties concerned in lighting, such as radiation, reflection, colors of illuminants and color effects in general, visual peculiarities of luminous perception, etc.; the fourth and fifth chapters treat of primary and secondary standards of light intensity and photometric units and their definition. In the middle part of the book photometry is considered in three chapters, of which the first discusses its principles and describes laboratory photometers, the second takes up portable photometers, and the third explains light-flux calculations and describes spherical photometers. The last four chapters deal with illumination, two of these treating of illumination calculations from point and surface sources and the last two setting forth the principles of interior and exterior lighting. An appendix contains tables of trigonometric functions, constants for point-by-point calculations, wiring data and symbols.

From this hasty summary of the leading topics of the text it is evident that the author has provided for his student readers a very thorough grounding in the science of illuminating engineering. In fact, most of what

has been published on this phase of the subject since this branch of engineering received recognition finds proper reference in Professor Barrows' book. Much of the matter is presented in the original or substantially original form, although for the lay reader it probably would have been better to epitomize or rewrite it in simple form. The mathematics appearing in the book is not formidable, at least for a college student.

It is noticeable that only two of the twelve chapters are devoted to discussion of the actual practice of interior and exterior illumination, and this largely from the writings of only one illuminating engineer. It would seem that with the excellent scientific foundation laid in the first ten chapters, there should have been more complete exposition of those principles of the practice of illuminating engineering on which there is now substantial agreement. While the practicing engineer may not need to be reminded of this aspect of the subject, the embryo engineer should undoubtedly be given a broader view of what will confront him when he comes to apply the laws he has studied. It is to be hoped that the author will expand this part of the book in a future edition.

Professor Barrows has very properly left out almost entirely the long descriptions and discussion of characteristics of the common illuminants and accessories usually found in similar books on the subject. He has given a good summary of the work he has found suitable for his own students of illuminating engineering. In view of the fact that definite courses on this subject are still very rare, it is not surprising that the author has not carried the work as far as would seem to be desirable. On the contrary, he is to be commended for setting forth in condensed handbook form quite a complete exposition of the scientific principles at least on which all actual work in illuminating engineering must be based.

"Measurement of High Temperatures." By G. K. Burgess and H. Le Chatelier. Third edition, rewritten and enlarged. New York: John Wiley & Sons. Cloth, 510 + xviii pages (5¾x 8¾ inches), 178 illustrations. Supplied by the Electrical Review Publishing Company for $4.00.

This is a comprehensive treatise upon the subject of high-temperature measurement, in which field the two authors are recognized authorities. Professor Le Chatelier has been a pioneer in the development of this subject, as exemplified in optical pyrometry and thermoelectric couples. Dr. Burgess, who is associate physicist in the Bureau of Standards, has given his attention for years to precise measurements in this same field. The book is not confined to the two divisions above mentioned, although these receive extended treatment. The use of the electrical-resistance thermometer has an entire chapter devoted to it, as do also the use of the gas thermometer and calorimetric pyrometry. The earlier pyrometric methods, as represented by the meldometer, the use of fusing points, dilution pyrometers, transpiration pyrometers, etc., are treated in one chapter. The last chapter is devoted to the standardization of pyrometers and will especially interest the reader who is concerned with precise measurements. This book is probably the best treatise upon this subject which is now available. An appendix contains a bibliography of the subject, and there are a number of valuable tables, including melting points, boiling points, platinum resistances, absorbing powers for radiation, etc.

"The Practical Electrician's Pocket Book and Diary for 1913." Edited by H. T. Crewe. London: S. Rentell & Company, Limited. Cloth, 440 pages and appendix (3½x5 inches), illustrated. Price in cloth binding, one shilling; in Rexine, 1/6.

This little pocketbook contains much information which will be found useful for ready reference and is illustrated with diagrams and halftones of electrical apparatus. A chapter on the control of lighting circuits should prove of interest to every contractor. There is included in the book a list of central stations in the United Kingdom, with names of the engineers and figures as to rates, operating voltage, etc. Considerable space is given to electrical application to coal mining.

"The 'Mechanical World' Electrical Pocket Book for 1913." Manchester: Emmott & Company, Limited. Cloth, 240 pages and appendix (4x6 inches), illustrated. Price, sixpence.

This book contains a number of mathematical and engineering tables and much condensed information on various aspects of electrical engineering and allied topics, such as require attention of the operating engineer. There are also certain sections which will be of use to the contractor, such as wiring data, fuses, switches and lamps.

"Engineering and Metallurgical Books, 1907-1911." By R. A. Peddie, New York: D. Van Nostrand Company. Cloth, 206 pages (5x7 inches). Supplied by the Electrical Review Publishing Company for $1.50.

This is a valuable compilation of the bibliography of recent date dealing with the different branches of engineering and metallurgy. Electrical subjects come in for extensive treatment, and the book should prove valuable to anyone attempting to get in touch with recent publications along these lines. The book does not attempt to cover books outside of the English language and publications later than 1911 will be treated in a supplement, which is stated to be in preparation. There is a separate index of the names of authors. A cursory examination does not impress the reviewer with the completeness of the work, as the names of some well known writers upon electrical subjects are missing.

"Hirsch-Wilking Electro-Ingenieur-Kalender, 1913." By Arthur H. Hirsch and Max Barth. Berlin: Oscar Coblentz. Flexible cloth, 372 pages (3¾x 6¾ inches) illustrated.

This is the thirteenth annual edition of this handy German pocketbook for electrical engineers. Included in it are tables of mathematical and physical constants, data on the construction of electric stations, discussions on choice of prime movers, the machines themselves, mechanical transmissions, the electrical equipment of stations, substations and transmission lines, power requirements and performance of machinery for various industries, electric railways, cost data, German laws relating to electrical undertakings, first aid in electrical accidents, etc. In the binding are incorporated convenient card and memoranda pockets and handy memoranda blanks are provided as a supplement.

The Byllesby's Weather Ohio and Indiana Storm.

Telegraph messages were flashed over the entire middle section of Indiana recently, amid the terrors of the worst storm in the history of the state, when Henry M. Byllesby, John J. O'Brien and Fred Stearns, respectively the president, first vice-president and general counsel of H. M. Byllesby & Company, of Chicago, were lost temporarily. The Byllesby party left Chicago for Louisville, Ky., where an important utility merger deal was in progress, the night before the cloudburst swept central Indiana. Arriving at Lafayette in the midst of the storm, the train bearing them could proceed no further and the party was sidetracked to Indianapolis, subsequently being isolated by the flood of White River, which cut off that city from surrounding country. The news of the marooning of the party created widespread excitement at both the Louisville and Chicago ends of the line. Ultimately George H. Harries, president of the Louisville Lighting Company and the representative of the Chicago company in Louisville, located his confreres in their haven of refuge.

New Electrical and Mechanical Appliances

Esterline "Golden Glow" Electric Headlights for Railway Service.

The Esterline Company, LaFayette, Ind., which has been making a very successful line of glass-reflector type fog-penetrating lamps for marine service, familiarly known as the "Golden Glow" lamps, quite recently announced a line of lamps of similar construction for electric railways, steam and mining locomotive service.

The design and construction of these lamps differ radically from other existing types, in that the reflector, instead of being a metallic or an enameled surface as is commonly used in most lamps, consists of a molded plate-glass parabola ground accurately to size and shape, then polished and silvered like a French plate mirror. The glass, by a secret process, is given a greenish-yellow color which is about the color of molten gold, hence the name "Golden Glow." It has long been recognized in lighthouse and marine work that a golden-yellow light will penetrate fog and mist to a much greater degree than will a white light, and many recent tests on the great lakes and the sea coast show that the Golden Glow lamps made by the Esterline Company have wonderful penetrative power.

Use of the new reflector also renders the light from the lamp much less dazzling, since it removes the actinic rays from the light, rendering it soft and mellow. Experience shows that not only is the light much less dazzling to pedestrians, but it is also less fatiguing to the motorman or the engineer who is driving by it.

The reflectors of the lamps, being made of glass, do not tarnish but retain their luster indefinitely. They can be cleaned without the possibility of harming or scratching the reflecting surface.

Golden Glow lamps for electric railway and steam locomotive service are built in two types. In Fig. 1 is illustrated the hood type lamp, designed for mounting on top of the car or locomotive. The dash type of lamp, in which a part of the lamp is recessed into the surface on which it is mounted, is illustrated in Fig. 2.

Housings for the reflectors are of metal, and the glass parabola is securely held in place with no possibility of its becoming loose or damaged. The illustrations show the lamps with the bulbs removed. A standard spherical incandescent bulb is used with a standard Edison base. The sockets for the bulbs have a large, heavy porcelain support which serves to thoroughly insulate the lamp. The reflector, being of glass instead of metal, also reduces the possibility of grounds or short-circuits.

The front, or door, of the lamp is hinged at the top. The upper hinge is made adjustable, so when the lamp is constructed all the play can be taken up and the front cover pressed tight against a gasket, rendering the lamp practically water and dust-tight. The front glass is held in by means of spring clips which, while they hold the glass securely in place, distribute the strain in such a manner as to render cracking of the glass very remote. The lower clamp for the cover is of the thumb-screw type with the screw turned back in order to keep it out of the way. In the design of the lamp, all unnecessary projections, which would be likely to catch wires or trolley ropes, have been omitted.

The lamp body is ventilated in such a manner that while water and dust cannot enter, it permits of a ready dissipation of the heat, so the lamps will not sweat. On account of the great efficiency of the reflector, the heat as well as the light, is reflected so the front glass will not remain coated with snow or ice in even the coldest weather, as the reflected heat keeps the glass free from snow and ice.

Circuit wires are led into the lamp at the rear, from below, through a length of iron conduit. In the hood type lamp this conduit is cut to a given length, but in the dash type an opening is left so the regular wiring conduit can be led to the lamp.

Announcement of the Golden Glow lamp has created a great deal of interest among street-railway men, and many companies who have had the lamps on trial test for the past six months have already adopted them as standard.

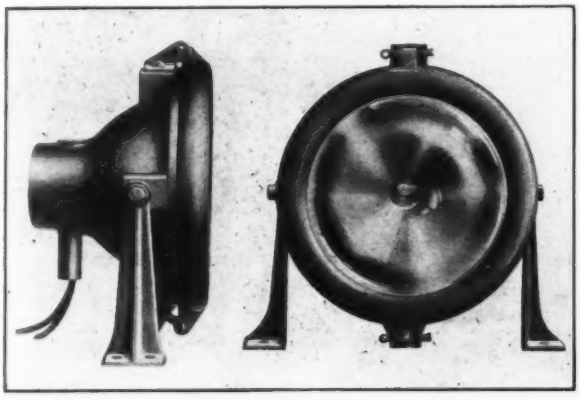


Fig. 1.—Side and Front Views of Hood-Type Golden Glow Headlight.

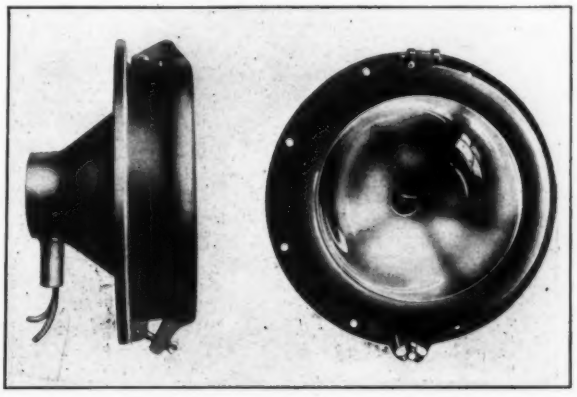


Fig. 2.—Dash Type of the Same Esterline Electric Headlight.

Constantinople is at last getting a modern telephone system, which should be completed before the fall of this year. The cable and outside plant is being furnished by the British Insulated & Helsby Cables firm; switchboards, instruments and other interior equipment is being supplied by the Hawthorne and Chicago works of the Western Electric Company.

Marshall's Protective Shield for Linemen.

The uninterrupted continuity of service is one of the first aims of every enterprising central-station company. This involves not only good construction and reliable operation but the ability to make unavoidable repairs, cutovers and necessary changes quickly and without breaking the circuit. However, work on live high-tension lines, whether they be overhead or underground, is always attended with much danger to even very careful linemen, and for this reason many companies prohibit it wherever possible and order the line to be opened before any work is done upon it, even though the supply must be cut off from a considerable number of customers. To lessen the annoyance of the interruption, it is often the practice to put off changes or repairs until the following Sunday or holiday, although much actual loss and direct increased repair expense may be incurred thereby.

From the foregoing it is evident that, in order to maintain a record for continuity of service and also to keep down the cost of work on high-tension lines, electric companies have seen the need for carrying on work on live circuits, if it can be done with greatly decreased hazard to the linemen. To supply this demand there was put on the market by H. E. Marshall a few years ago a protective shield, which in the several years it has been in use, has been found to meet the severe conditions imposed on it perfectly. The result is that thousands of these shields are now in successful use by the leading electric light, power and railway companies in this and other countries, and the device has the approval and indorsement of the American Museum of Safety and the largest casualty and liability companies.

The broad humanitarianism now coming to the front and the nation-wide agitation for providing adequate workmen's compensation for injuries in service, has aroused keen interest in every possible safety measure. For this reason a description of the Marshall linemen's shield is very timely.

The device is a flexible insulating trough with slotted tubular extensions and two handles at the middle and outside of the edges for manipulating it. The shield is made of alternate layers of Para rubber and heavy canvas. On the outside there is a heavy layer of rubber, then a sheet of canvas, then another layer of rubber, followed by another layer of canvas laid crosswise to the former, and finally an inner layer of rubber. The thickness of the rubber varies from three-eighth inch, where it is subjected to pressure, to three-sixteenth inch at the flaps. Two solid hard-rubber rings surround the extensions near the main body of the shield in order to securely fasten it to the wire.

There are a variety of ways in which the shield may be used. At the top of Fig. 1 is shown how it is applied right over the insulator and line; the slotted extensions fit over the wire and the hard-rubber rings are turned so as to clamp the entire shield in place over the live line. The lower portion of the same illustration shows two of the shields installed in this manner. There are also shown there, two shields opened flat and bent transversely over the cross-arms to afford an insulated footing and guard against possible ground connections through a wet arm and pole. In Fig. 2, the upper man has his left foot and leg insulated from the pole by using the shield as a sling. The lower man in Fig. 2 is insulated from the transformer by means of a shield opened out over its top. These

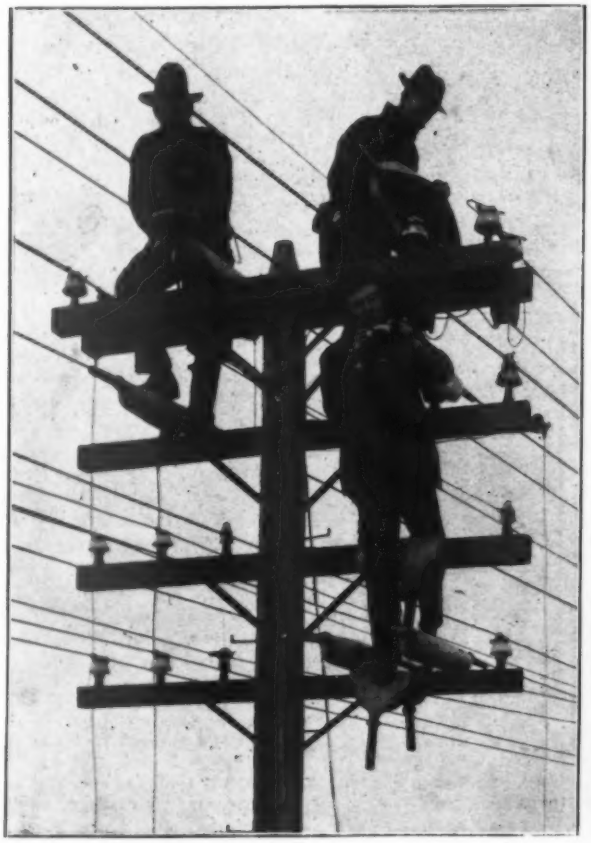


Fig. 1.—Use of Protective Shield on High-Tension Lines.

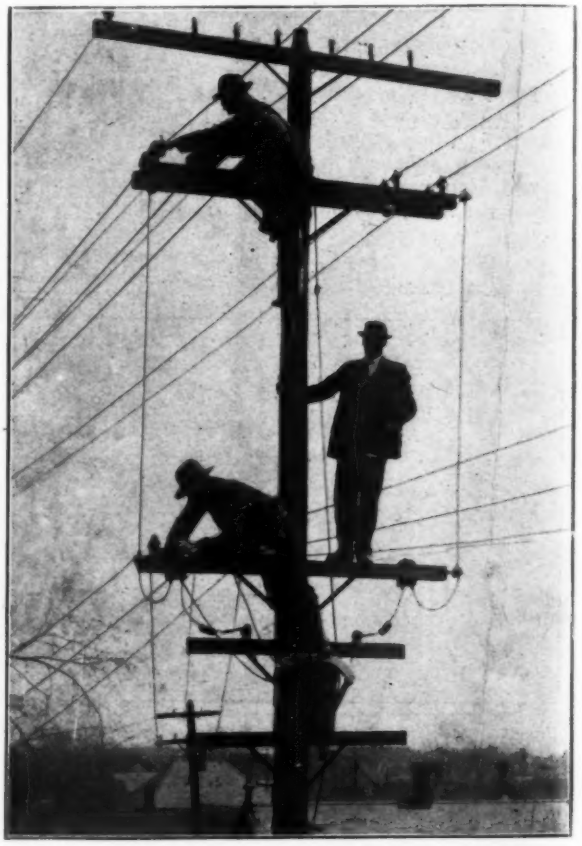


Fig. 2.—Other Uses of the Linemen's Shield.

are typical uses for the shield on pole lines.

The shields have also been advantageously used in similar ways. In trimming arc lamps on live circuits the lamp can be lowered to within reach of the ground and the trimmer can then insulate himself from the ground by standing on a shield. Other uses for the shield, such as removing broken live wires from the ground, have also been found. They are valuable not only for linemen but also for firemen when they have to fight a blaze near high-tension lines. In actual use the shields have been the means of saving many lives and at the same time they have reduced the cost of repairs and changes on lines very materially.

These shields are recommended for all circuits to 10,000 volts. Before leaving the factory, however, each shield is subjected to a submerged test at 30,000 volts. The shields are made and supplied by the Linemen Protector Company, Whitney Building, Detroit, Mich.

Audiffren-Singrun Small Refrigerating Machine.

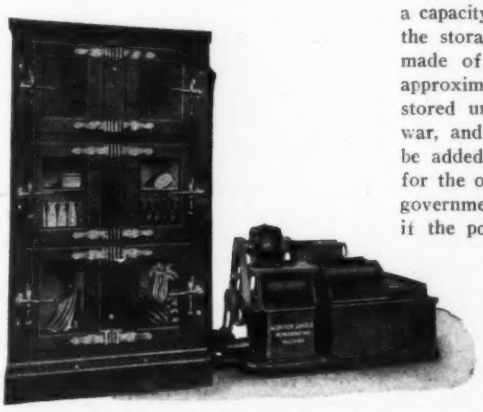
For many years there has been a growing demand for a small refrigerating machine adapted to private homes, apartment houses, clubs, cafes, hotels, hospitals, butcher shops etc. Ordinary refrigerating machines have usually been found to be impractical for several reasons: the initial cost and the cost of the operation was too great; the use of a highly compressed refrigerant, with its attendant risk of explosion, rendered them dangerous; owing to their complex mechanism, an experienced engineer was required to operate them.

These difficulties have been overcome by a little machine known as the Audiffren-Singrun refrigerating machine, which has recently been put on the American market by the H. W. Johns-Manville Company. This machine was first placed before the public in France over seven years ago, and is therefore not in the experimental stage. Hundreds are now in use, many of which have been running ever since the installation without repairs, recharging or any other upkeep expense.

This machine meets the demand for mechanical refrigeration on a small scale. It eliminates the expense of ice, the uncertainty of its supply, and the unsanitary conditions caused by its use. Because of its simple design, it is claimed anyone can run it. A switch is thrown in place and the machine starts, making ice or just producing cold. When the switch is thrown off, the machine stops. That is all the operator needs to know about it.

Refrigeration produced by this machine has many advantages over the old-fashioned method of refrigeration. It does away with the slop and muss caused by the ice-man bringing the ice in from the street, and puts an end to the slime and dirt that ordinarily accumulate in the ice-storage compartment. Bacteriological statistics show that the ordinary ice-box is a breeding ground for millions of germs, due to the dampness of the melting ice and to the fact that the temperature runs from 50 to 70 degrees Fahrenheit. The low, dry temperature of the Audiffren-Singrun machine is claimed to not only prevent the breeding of germs but to keep food sweeter, fresher and more inviting than when stored under the old-fashioned conditions.

The Audiffren-Singrun machine operates on the compression system, using sulphur dioxide as refrigerating agent. This gas is used because it can be condensed or liquefied at low pressure, thereby eliminating possibility of leaking connections, explosions, etc. Externally the machine is very similar to a large dumb-bell, consisting of two drums or globes mounted on a hollow shaft. When these drums are revolved the machinery within them is set in motion, producing the cooling or refrigerating effect. There are no joints, valves, or stuffing boxes, gauges, or anything else to watch or care for, and the operation is simplicity itself. One motion turns on or off the power and also the water. The machine is sent from the factory completely charged and hermetically sealed, ready to be placed on its bearings and started. Any form of power may be used to operate it, although an electric motor is generally preferable.



Audiffren-Singrun Motor-Driven Refrigerating Machine.

A special advantage of the Audiffren-Singrun machine is its ability to operate with a very small quantity of condensing water and also with much warmer condensing water than other types of refrigerating machines. On account of its compact proportions, the machine can be installed in a very small space. When there is nothing in the refrigerator to be cooled, or when the temperature has dropped to the desired point, the machine can be stopped for a couple of hours, resulting in a saving of power.

The field of uses for the Audiffren-Singrun machine includes many other applications in addition to those named at the beginning of this article. It is recommended for cooling the supply of drinking water in factories and also for cooling liquids in various industrial processes.

Coal-Handling Machinery for Panama Canal Coaling Plants.

Two large coaling plants are to be established at the Atlantic and Pacific entrances to the Panama Canal, at Cristobal and Balboa, respectively. Specifications for the machinery of the two plants have been completed and advertisement for bids will shortly be made by the Isthmian Canal Commission.

It is planned to have a coal-storage basin at Cristobal with a capacity of 290,000 tons, and one at Balboa with a capacity of 160,000 tons. In each place the storage will be within a large basin made of reinforced concrete, in which approximately half of the coal will be stored under water for use in time of war, and the other half above water to be added to and taken from continually for the ordinary uses of commercial and government vessels. It is also planned, if the policy should be approved, to be able to lease parts of the storage basin to such private coaling companies as may wish to maintain their own coal stores on the isthmus; but in such cases all of the handling will be done by the government plant, a suitable charge being made for the service.

The specifications are not hard and fast, but merely establish certain general methods and standards, leaving it to manufacturers to devise suitable machines. A large amount of coal-handling machinery will be required and most of this will probably be electrically operated.

Cooking Activity in England.

A. F. Berry, inventor of the "Tricity" electric cooker, addressing stockholders in the company which makes that apparatus, said that a great extension of the use of electric cooking in England was now expected. As a proof of this he said that some 25 manufacturers were contemplating starting the making of such apparatus. Twenty-eight electric supply authorities are already hiring out "Tricity" cookers.

Bristol's Recording Differential-Pressure Gauges.

A comprehensive new line of recording differential-pressure gauges has been developed by the Bristol Company, of Waterbury, Conn. Some of these recorders have been in successful service continuously since the preliminary models were first sent out in 1908, and the design and construction of the line of these instruments now being placed on the market is based on results obtained in actual service during the last four years. These recording differential-pressure gauges are designed for use in connection with venturi meters, pitot tubes, orifices, combinations of orifices and pitot tubes, etc., and thereby to record velocities and volumes of air, gas, steam, water and other liquids flowing through mains and pipes. These recorders may also be used to advantage for recording differences and variations of liquid level in steam boilers, pressure tanks, filter beds, process kettles, etc.

Important patents dated September 12, 1911, and September 17, 1912, have been issued to Prof. Wm. H. Bristol, president and founder of the Bristol Company, covering novel features resulting from his pioneer work in developing differential recorders in addition to the other numerous lines of well

Fig. 1.—Recording Differential-Pressure Gauge.

known Bristol recorders which he has originated during the 24 years which have elapsed since his first patent was allowed on a recording pressure gauge.

The fundamental principle employed in the construction of this differential-pressure gauge is that one pressure is applied to the inside of the operating tube while the other is applied to the outside of the same pressure tube within a close casing. In order to record the movement of the pressure tube it becomes necessary to transmit its motion to the outside of the pressure-tube casing. As the differential pressure to be recorded is usually small as compared with the static pressure, the operative force is correspondingly small, and it is quite evident that it will be impractical to use a stuffing box

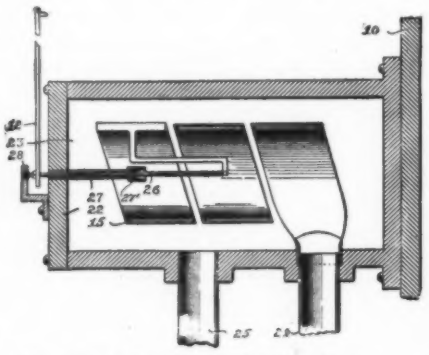


Fig. 2.—Interior of Helical-Spring Type Pressure Tube.

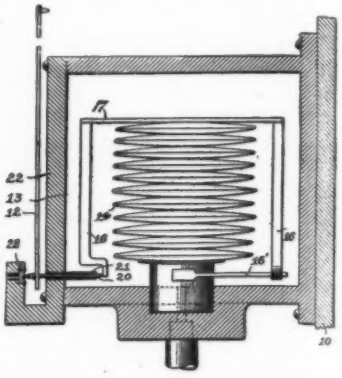


Fig. 3.—Interior of Diaphragm-Type Pressure Tube.

around a shaft passing through a pressure casing on account of the friction which would be produced. To avoid the use of a stuffing box a unique frictionless sealing device is employed, as described in detail below.

Fig. 1 shows the exterior of one type of these recorders. In Fig. 3 is shown part of the interior construction of the spring-tube type differential recorder. In Fig. 2 pressure tube *15* is of the hollow helical type used with great success for many years in Bristol recording pressure and vacuum gauges. One of the pressures, the difference of which is to be recorded, is applied to the interior of this tube through the pipe *24* and the other pressure is applied to the exterior of this tube through the pipe *25*. It will be noted that the pressure tube *15* is entirely inclosed in the pressure-tight casing *22*. The movement of the pressure tube will be in proportion to the difference between these two pressures, and this motion is transmitted to the recording pen arm *12* (outside of the pressure casing) by means of small shaft *26* through the long tubular sleeve *27*. The capillary action of the oil or liquid between the sleeve and shaft makes this patented joint both frictionless and pressure-tight.

In Fig. 3, *22* is the pressure-tight casing inclosing the diaphragm pressure tube *14*, and in a similar way one pressure communicates with the interior and the other pressure with the exterior of this tube, and its motion is transmitted by means of the rotating shaft *20* through the sleeve *21* to the rotating pen arm *12*. The length of this sleeve is many times the diameter of the shaft passing through it, differentiating it from an ordinary bearing.

This patented device permits of the recording of extremely small differences between the pressures existing respectively inside and outside of the pressure tube. It has been found that the simple frictionless sealing sleeve through which the pen-arm shaft passes does not produce appreciable resistance to the rotation of the shaft and at the same time capillary attraction and adhesion prevent leakage of even high pressures from the casing.

In Fig. 4 diaphragm tube *8* is shown in the pressure chamber of the casing *11* directly connected to one end of the rotating shaft passing through the patented pressure seal, and having its

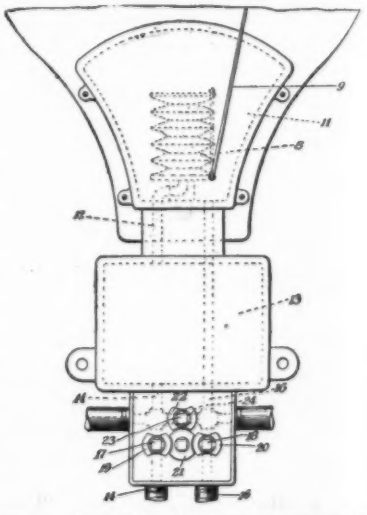


Fig. 4.—Connections for Diaphragm-Type Recorder.

other end directly connected to the recording pen arm, *9*.

This diagram also shows a set of interlocking valves *17*, *18* and *23*, which constitute a device for adapting recording differential-pressure gauges to practical operating conditions. Cross-

valve *22* is shown in an open position connecting the two pressure pipes. Valves *17* and *18* in the pressure pipes are shown closed. Both of these valves can be opened, allowing the static pressure from either pipe to be applied simultaneously to the inside and the outside of the pressure tube of the actuating mechanism. The interlocking member *21* can then be turned through an angle of 90 degrees, thus making it possible to close valve *22* which completes the connections so that the instrument will record the difference of the two pressures.

Fig. 5 shows a patented safety device consisting of a U-shaped tube partly filled with a suitable liquid such as mercury or water, this tube having en-

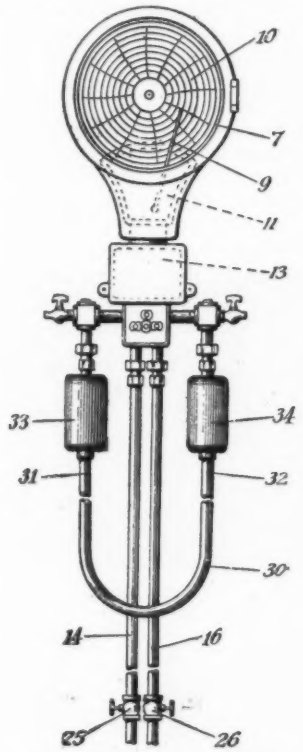


Fig. 5.—Safety Device for Use With Recording Differential-Pressure Gauge.

largements *33* and *34*, each of sufficient volume to accommodate the quantity of liquid contained in the U tube. The length of this tube varies with the range of the gauge so that the greatest possible head of the liquid contained in the U tube corresponds with the total range of differential pressure that the gauge is designed to record. Should the full static pressure by accident be admitted to either side of the differential gauge, the liquid contained in the safety U tube would instantly be forced up into one of the enlargements, thus allowing the static pressure to be applied simultaneously to both inside and outside of the pressure tube and protecting it from being destroyed.

Metal Holders for Outlet Boxes in Buildings of Wood-Joist Construction.

A very clever device for this purpose has been placed on the market by McKinley Outlet Box Holder Company, 411 Commerce Building, Kansas City, Mo. The device consists of two pieces, the holder and a brace. The holder is made of No. 14 gauge iron, two inches in width and of sufficient length to permit the outlet box being installed at any point between the joist. The base has two slots running the entire length through which it is nailed to the bottom of the joist thereby permitting quick and ready adjustment, and is fastened to the body by the same bolts which hold the fixture stem.

The brace is made of strap iron one-sixteenth inch thick and three-quarter

McKinley Outlet-Box Holder.

inch wide. One end of this brace is made to fit the locking arrangement where it attaches to the holder, and the other end is perforated so it can be nailed to the side of the joist. This makes a rigid support and can be used with either straight electric or combination work, is adjustable to any position between the joist and does not obstruct the knockouts in the back of the box.

The illustration herewith shows the No. 1 holder as it is used with a standard outlet box having a depth of three-quarter inch and using an open cover for lath and plaster work. This same holder can also be used with outlet boxes having a depth of one and five-eighth inches where the open cover is not used. The No. 2 holder, which is the same as the No. 1, only having a deeper offset, is for use with all standard outlet boxes having a depth of one and five-eighth inches and using an open cover for lath and plaster work, and is also used with outlet boxes having a depth of 2.25 inches without the open cover. The No. 3 holder is similar to No. 1, but has no offset and is for use with all standard outlet boxes having a depth of three-quarter inch without the open cover.

These holders have the approval of the Underwriters' Laboratories and their cost to the contractor is said to be from 25 to 50 per cent less than the expense of nailing in boards; besides, the boxes will all be uniform and flush with the plaster when completed.

Motor-Driven Coffee Mill.

Any ordinary double-flywheel type of coffee mill operated by hand can very readily be changed to motor drive. The work of installation is simple and inexpensive. The cost of operation is almost negligible since more than 25 pounds of coffee can be ground for one cent. With an electrically driven mill, the clerk fills the receptacle, turns the starting switch, and, while the coffee is being ground, continues waiting on the customers. In this way, considerable time and labor is saved, and the efficiency of employees greatly increased. Another point of advantage is the saving in floor space. The mill can be put in a corner or in any out-of-the-way place, and the valuable space it formerly occupied, along with the adjacent standing room needed for the clerk in turning the handle, can be utilized for the display of stock or for some other profitable purpose. When grinding a large quantity of coffee at one time, a motor-driven mill not only saves time but also a great deal of hard work, as hand grinding is especially irksome if prolonged.

The motor can be mounted on the floor or wall close to the mill, or on the frame. A large number of motors especially adapted to such service have been manufactured by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Largest Hydroelectric Power Plant in Europe.

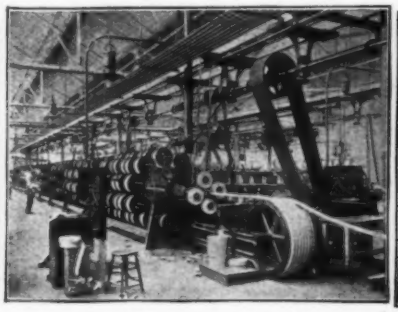
There is under construction near Nore, in Norway, a powerful hydroelectric station which, on completion, will be the largest plant of its kind in Europe. It will contain eleven hydraulic turbines rated at 20,000 horsepower each, and two of 10,000 horsepower each, making a total of 240,000 horsepower. The main building of the plant is 525 feet in length. It is at the foot of a high hill on top of which the inlet basin is located. The latter is fed by a flume 3.7 miles long leading from a large reservoir. The total available head is 1,378 feet. Electrical energy will be supplied to the Norwegian capital, Christiania, and throughout southern Norway.

How Telephone Cable is Made.

Merely stating that modern telephone cable consists of a group of copper wires, insulated by a wrapping of manila paper, twisted into pairs, and inclosed in a lead sheath, does not convey any idea of the complexity of the processes by which it is manufactured. These processes, as carried on in the Hawthorne works of the Western Electric Company at Chicago and Hawthorne, Ill., were described in a recent issue of the *Western Electric News*.

The materials of which cable is composed are copper wire, manila paper, tin and lead. These are furnished by the carload, the wire rolled in coils, the paper wound on spools, and the tin and lead in bars, known as "pigs." The wire is known as soft drawn. It has been thoroughly annealed, i. e., softened and made flexible and drawn to the proper diameter, and differs from the so-called hard-drawn wire used in outside line construction in its toughness and flexibility. The paper, which varies in thickness from 0.0025 to 0.014 of an inch, is especially made from the best manila-rope fiber and is consequently very tough and durable.

Insulating the Wires.



Forming the Cable Core.

Lead-Sheathing the Core.

The metals are chemically pure tin and lead.

The Insulating Process.—The first process that is actually carried on in the cable, rubber and insulating shops at Hawthorne is that of insulating the copper wire with its paper wrappings. The insulating machine consists of a number of revolving disks, an equal number of capstans, or large pulleys, and the take-up reels. The bare wire is coiled loosely around large iron spindles. From there it passes over the pulleys at the top of the machine through the center of the revolving disks. In the face of each disk a pad of the insulating paper is placed, and as the wire is pulled through the hole in the center by the capstan beneath, the disk revolves, winding the paper around the wire in the form of an endless spiral. The insulated wire then passes over the capstan and is wound upon the take-up reel below.

Each disk is driven by an individual motor, and applies the paper to the wire at the rate of 2,400 to 3,000 wraps or turns a minute. Various colored papers are used, in order to make it easy to identify different sizes of wire or different pairs of wires in the finished cable.

Pairing the Wires.—The insulated lengths of wire are now ready to be twisted into pairs. Two of the take-up reels containing insulated wire of the same color are placed in spindles in the machine. A capstan at the top of the machine then draws the wires through a yoke—a revolving plate pierced by two holes through which the wires pass—twisting them together, and leads the twisted pair to another take-up reel. The machine is so adjusted that the length of the twist, that is, the number of twists to the foot, may be altered at will. Different lengths of twist are used for different gauges or sizes of wire.

Forming the Cable.—The twisted pairs of wires now go to the stranding machine to be formed into a cable. This machine consists of a number of revolving drums, which look like enormous skeleton spools. On the outer circumference of these drums are arranged the reels containing the various pairs. A large capstan draws the center pair or pairs of wires straight through the center of the machine; at the same time the drums revolve and the other pairs are unwound from the reels and are twisted in alternate directions around the center. The finished core, as the unsheathed cable is called, emerges from the machine, and is wound upon the capstan. The last layer of pairs is covered with a double wrapping of paper, to protect the core from the lead sheathing.

In order to cut the cable to the lengths desired by the customer, one of the center pairs is carefully measured and the location of the end of this pair marked on the outside of the core. As it is often important to the customer that the lengths be absolutely correct, a check measurement is usually obtained, either by means of a recording device on the front of the standing machine, or by weighing the completed cable.

The Drying Process.—After leaving the stranding machine the entire length of cable core is carefully tested, to make sure that none of the wires are broken, and also that the paper insulation is perfect. The next process, that of drying, is very important, for the quality and efficiency of the cable depend to a large extent upon the care with which it is carried out.

The core is placed in gas ovens heated to 215 or 230 degrees Fahrenheit, and is kept there for a period ranging from 15 to 48 hours, depending on the size and length of the core, the amount of insulation, and the character of service for which the finished cable is intended.

Sheathing the Core.—When the core has been thoroughly dried, it is put through the last manufacturing process, that of applying the lead sheath. The lead press, or sheathing machine, on which this operation is performed is practically a machine for making lead pipe. It consists of a huge pot, or container for holding the metal, a core and die box, and a hydraulic press.

The container is filled with molten lead, to which an alloy of three per cent tin has been added. The bottom of the container opens into the top of the core and die box. The core is a pipe through which the cable passes; the die is a mold surrounding the core. The cable to be covered passes into the back of the machine, through the core and the die. By this time the lead in the container is no longer liquid, but has cooled sufficiently to be in a plastic state. It would not do to apply the molten lead to the cable core, because the hot metal would burn the paper insulation off the wires.

The hydraulic press, working at an enormous pressure, forces the plastic lead through the die, or mold, and around the cable core, thus surrounding the paper-covered wires with a continuous lead sheath of any length.

Final Testing.—As soon as the finished cable is cool enough to handle, it is given a final and very thorough electrical test. As it is essential that every cable contain at least as many perfect pairs of wires as are called for in the order, a few extra pairs are usually included in order to make up for any defective pairs that may be detected in the course of the final inspection.

Sealing the Ends.—When the cable has

tested satisfactorily, the ends of the core are impregnated in paraffin and the sheath is sealed up so as to prevent possible entrance of moisture, after which the finished product is ready for shipment. Testing of the cable is one of the most important phases of its manufacture.

The processes just described are those for making telephone cable in general. There are, however, different types of cable, and their manufacturing processes vary. The so-called "silk and cotton cable," which is used largely on the telephone subscriber's premises, particularly for Inter-phone installations, differs from the standard in that the wrapping of the bare wire consists of silk and cotton in place of paper. The so-called "wool cable," which is used in telephone exchanges between the manholes underground and telephone exchanges, has a wrapping of wool in place of the paper, the wool offering a greater resistance to moisture.

The modern lead-sheathing process places no limit on the length of a single cable. A cable recently made for the Western Union Telegraph Company consisted of two lengths of 37-pair cable, each of which was 5,500 feet, or over a mile, long. The thickest cable made contains 600 pairs of No. 22 gauge wire.

The cable factory is a one-story building, which at first glance seems insignificant when compared with the other and more massive buildings of the Hawthorne plant; but in reality this is the largest telephone-cable plant in the world. Enormous weights of raw material are handled, 2,000 tons of paper, 10,000 tons of copper, and 30,000 tons of lead being made into cable in a single year. The single-story building is the ideal cable factory, for with every process carried out on the same floor unnecessary lifting of the heavy material is avoided.

Shipping the Finished Cable.

There is not a single lost motion as the manufacture progresses. At the east end of the building, cars containing raw material are unloaded and the sequence of the locations of the departments (insulating, twisting, stranding, baking and sheathing) is arranged so as to correspond with the order in which the cable evolves. At the other end of the plant the finished product is rolled into cars.

New Opaque Mirrored-Glass Reflectors.

In order to meet more completely the great variety of special conditions to be solved in many direct-lighting problems ,the National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, has added two new designs to its extensive line of X-Ray reflectors. One of these has been designated as the Visor reflector and is the fourth of its series designed solely for efficient and uniform store-window lighting, the other three being the Helmet, Scoop and Poke Bonnet reflectors.

Fig. 1.—Visor Window Reflector.

There are many store windows with comparatively low backgrounds, or backgrounds of transparent glass or no background at all, that have imposed two additional requirements for

Fig. 2.—Light Distribution with Visor Reflector.

scientific window illumination that had to be met by illuminating engineers. The first was the problem of concealing the lamp from passersby and onlookers in front of the window, and also from people inside the store. Secondly, there must be no reflection of the glare of the lamp visible from the street, as this seriously mars the attractive stage-lighting effect of providing a bright uniform light from hidden sources.

The X-Ray Visor reflector illustrated in Fig. 1 meets these requirements. It prevents light being wasted by passing over the background into the store, it hides the lamp from the ordinary range of vision completely, and covers the lamp in such a way that its reflection cannot be seen in the glass or polished background of the window.

Visor reflectors are designed for use with 60 or 100-watt Mazda lamps and require a 2.25-inch form H holder. The reflector dimensions are: depth from front to back, 10⅝ inches; width, 9½ inches; height, 8 9/16 inches. Fig. 2 shows the general character of the light distribution obtained.

Fig. 3.—Concentrating Reflector (No. 710).

There has also been added to the line of direct-lighting reflectors for use in factories, warehouses, shops, over counters and special machinery, etc., a new type of X-Ray reflector designated as No. 710. It is a concentrating reflector suitable for 60-watt and 100-watt lamps. Its height (6.75 inches) is such as to entirely screen the lamp from view unless one looks up into it directly from below. This reflector is 11.5 inches in diameter and requires a 2.25 inch form O holder.

Western Maryland Railroad Installs Telephones for Dispatching Trains.

The Western Maryland Railroad Company has joined the long list of railroads using the telephone for the dispatching of trains and has recently ordered equipment for its lines from the Western Electric Company, which has furnished the telephone apparatus used by 90 per cent of the railroads of the United States that use that method of handling trains.

The apparatus to be used is the No. 102 type selector set containing the No. 50 selector and 23 way stations will be equipped with selective signaling and telephone apparatus.

The present equipment will be installed over a circuit extending from Hagerstown to Cumberland, Md., a distance of 80 miles. This section of road is the first of 400 miles to be equipped with telephone train-dispatching apparatus.

Latest Approved Fittings

CABINETS.—Hamilton Sheet Metal Works, Hamilton.
Approved February 26, 1913.

CONDUIT OUTLET BUSHINGS AND COUPLINGS.—National Metal Molding Company, Fulton Building, Pittsburgh, Pa.
"National" Coupling and Locknut, made of malleable iron sherardized; for use with armored and flexible conduit.
Catalog No. 2163.
Approved February 24, 1913.

FIXTURES.—Empire Gas Fixture Company, 226 Centre Street, New York, N. Y.
Approved February 28, 1913.

FIXTURE WIRE.—Simplex Wire & Cable Company, 201 Devonshire Street, Boston, Mass.
Marking: Red cotton thread upon smooth rubber surface lengthwise of wire and under braid.
Standard, National Electrical Code, 1911 Edition.

Lamp Adapter.—Benjamin Electric Manufacturing Company.

Approved February 8, 1913.

FLEXIBLE CORD.—Imperial Wire & Cable Company, Limited, Montreal, Canada.
Marking: Two yellow threads cabled with copper strands.
Standard, National Electrical Code, 1911 Edition.
Approved February 12, 1913.

LAMP ADAPTERS.—Benjamin Electric Manufacturing Company, 128 South Sangamon Street, Chicago, Ill.
Reducer adapter, catalog No. 98.
For medium-base lamps in receptacles for mogul-base lamps.
Approved February 24, 1913.

RECEPTACLES.—Candelabra and Miniature.—Federal Electric Company, Lake and Desplaines Streets, Chicago, Ill., for Federal Sign System (Electric), sole agents, Chicago, Ill.
"F. E. Co.," 75 watts, 125 volts.
Sign Receptacle, Catalog No. 310. Screw-clamp type.
Approved February 3, 1913.

The electric fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

RECEPTACLES, For Attachment Plugs.—Bryant Electric Company, Bridgeport, Conn.
Heater control combination. Catalog Nos. 398, 419, 437, 438, 466, each consisting of an assembly of two or more of the following parts, mounted on a single porcelain base: Receptacle for attachment plug indicator-lamp or receptacle, and switch.
Also PFC face plate, for mounting a standard receptacle, switch, and receptacle for attachment plug.
Approved March 3, 1913.

RECEPTACLES, Standard.—Benjamin Electric Manufacturing Company, 128 South Sangamon Street, Chicago, Ill.
Keyless, porcelain shell.
"Benjamin," 660 watts, 250 volts; Catalog Nos. 87 and 88, conduit-box type.
Approved February 24, 1913.

RECEPTACLES, Standard.—Arrow Electric Company, Hartford, Conn.
"Arrow E" Porcelain Shell.
Key, 250 watts, 250 volts. Cleat, Catalog No. 4007; Concealed, Catalog No. 4009; Molding, Catalog No. 4011.
Keyless, 660 watts, 250 volts. Cleat, Catalog No. 4008, Concealed, Catalog No. 4010; Molding, Catalog No. 4012.
Approved December 14, 1912.

RHEOSTATS.— Allis-Chalmers Company (Works of Bullock Electric Manufacturing Company, Norwood, O.)
Grid-type rheostats for use with alternating-current apparatus.
Motor-starting rheostats (induction motors). Type "A. N. Y." Capacities, 50, 200, 400 and 700 amperes.
Speed regulators (induction motors). Type "A. N. Y." Capacities, 50, 200, 400 and 700 amperes.
Approved January 27, 1913.

SHADEHOLDERS.— The Bryant Electric Company, Bridgeport, Conn.
"New Wrinkle" shadeholders; catalog Nos. 440-442 inclusive. A brass shadeholder made in four parts, consisting of a split ring, solid ring, shade support and locking wire, designed to fit over outside shells of brass-shell sockets or receptacles.
Approved January 29, 1913.

SIGNS, Electric.—Greenwood Advertising Company, (Western), Los Angeles, Cal.
Approved February 4, 1913.

SOCKETS, Standard.—The Yost Electric Manufacturing Company, Toledo, O., for American Brass and Copper Company, 132 Lafayette Street, New York, N. Y., sole agents.
"American" brass-shell sockets.
Key 250 watts, 250 volts; keyless, 660 watts, 250 volts.
Approved February 25, 1913.

SOCKETS, Weatherproof.—The Arrow Electric Company, Hartford, Conn.
"Arrow E," porcelain shell sockets.
Catalog No. 8125, 660 watts, 250 volts. (For temporary outdoor use and only when connected to stranded rubber-covered wires.)
Catalog No. 9366, 660 watts, 600 volts. (For use with incandescent lamps in series on 600-volt circuit.)
Approved February 26, 1913.

SOCKETS, Standard.—Benjamin Electric Company, Limited, 11-17 Charlotte Street, Toronto, Ont., Canada.
"Benjamin" brass-shell; key, 250 watts, 250 volts.
Catalog Nos. 59480, 59481.
Approved February 24, 1913.

Sign Receptacle No. 310.—Federal Electric Company.

SWITCHES, Automatic.—Palmer Electric Manufacturing Company, 161 Franklin Street, Boston, Mass.
Type "L" remote control switch; 30, 60, 100, 150 and 200 amperes, 250 volts; one, two, three and four-pole, for direct and alternating current.
Catalog Nos. 280-299, inclusive.
A switch of special design, mounted on a slate base, and arranged to be controlled by momentary contact switches at remote points.
Approved February 25, 1913.

SWITCHES, Fixture.—The Bryant Electric Company, Bridgeport, Conn.
"Wrinklet" Candle; key, catalog No. 449.
"Wrinklet" Candle; pull, catalog No. 450.
Approved January 29, 1913.

WIRES, Rubber-Covered.—Standard Underground Cable Company, Hamilton, Ont., Canada.
Marking: Green thread woven in braid in a clockwise direction.
Standard, National Electrical Code, 1911 Edition.
Approved February 7, 1913.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

WHEELING, W. VA.—A franchise has been granted to Ora Wise for the erection of an electric light plant.

BELOIT, WIS.—The boulevard system of electric lighting is under contemplation by the Council.

DOVER, DEL.—The Durham Light & Traction Company has been incorporated with a capital stock of $1,000,000 by W. F. Cook, of this city. N.

ENID, OKLA.—Announcement has been made that the Enid Electric & Gas Company will spend over $7,000 in improvements in its two plants here.

WHITESBURG, KY.—An electric light and power plant is to be installed in the immediate future by Wesley Wright, of Wright & Chase, Jenkins, Ky. G.

BISHOP, CAL.—The Southern Sierra Power Company has been granted permission to construct a line from near Lone Pine station to Keeler and vicinity.

GILCHRIST, ILL.—Edwards River Power Company has been incorporated with a capital stock of $10,000 by J. W. Walsh, E. C. Walsh, Jr., and Paul Wagner.

LEXINGTON, KY.—The lines of the Kentucky Utilities Company are to be extended at once from Shelbyville to Pleasureville, New Castle and Eminence. G.

NACOGDOCHES, TEX.—The City Council has purchased the electric light and power plant of the Nacogdoches Light & Power Company, and improvements will be made. D.

CANTON, O.—The Council is advertising for bids for the installation of 150 Mazda lamps to be furnished at a maximum rate of $18 each per year, and to burn all of every night.

WILMINGTON, DEL.—The Milk's County Power Company has been incorporated with a capital stock of $250,000 for the purpose of constructing and maintaining heating plants, etc.

LOS ANGELES, CAL.—Plans have been completed by the Pacific Light & Power Company for the immediate construction of two large power houses on Big Creek, 80 miles east of Fresno.

IRVINE, KY.—Dr. Elmer Northcutt represents Chicago capitalists who propose to erect and operate an electric light and power plant in this city as soon as the necessary franchise can be secured. G.

PORTLAND, ORE.—Mayor Rushlight is being urged to take steps to obtain an option on the power site on the Clackamas River, 12 miles from this city, for the proposed municipal lighting plant.

RIDGEFIELD PARK, N. J.—The Board of Commissioners of this village invite bids for furnishing the village with electric street lighting for a period of two years. Bids will be opened on April 8.

JERSEY CITY, N. J.—The Public Service Electric Company will build an addition to its Marion Power Station, on Duffield Ave., to cost about $80,000. A building permit for the structure has been issued. A.

MIDWAY, KY.—The Kentucky Utilities Company, of Lexington, Ky., recently purchased the municipal electric light and power plant from this city and will enlarge the station to meet the demand of the increased load upon it. G.

LA MOURE, N. D.—The City Council has granted a charter for an electric-light plant to I. I. Bennett, and the provisions of the franchise call for the establishment of the plant within six months; the franchise to run for 30 years.

DALLAS, TEX.—The Dallas Chamber of Commerce is agitating the construction here of a municipal electric light plant to cost about $375,000. At a recent meeting of the organization the subject was discussed but no definite action has yet been taken. D.

CENTERVILLE, IND.—By a popular vote in this town it has been decided to negotiate for the supply of electric light for the town. It is estimated that it will cost $6,000 to install the poles and wires, which, it is understood, will be undertaken.

WATERTOWN, N. Y.—The Watertown Light & Power Company intends to run a power line from South Edwards to Edwards and will supply the Northern Oregon Company with electric power. It is stated that the line will ultimately be extended to Natural Bridge.

KIRKSVILLE, MO.—Dr. C. E. Still, who is Republican nominee for mayor of this city, has announced that in the event he is elected he will supply without charge to the city 76 48-candlepower lamps in Kirkville immediately. Dr. Still is a stockholder in the Electric Light & Star Coal Company.

CHRISTIANSBURG, VA.—It is said that a substation will be built here by the Appalachain Power Company, which has recently taken over the plant and franchise of the Montgomery Electric Company. The new owners will supply power for ventilating the tunnels of the Virginia Railroad near here.

DOVER, DEL.—The Peoples Light & Power Company has been chartered for the purpose of engaging in the electric light, heat and power business in Wilmington. The company is capitalized at $250,000 and the incorporators are Spotswood Garland, Thomas F. Barry, Dr. L. Heisler Ball and Richard W. Crook.

GLOVERSVILLE, N. Y.—The Fulton County Gas & Electric Company, of this place, has applied to the Public Service Commission for permission to issue $28,000 of its six-per-cent three-year notes; $23,000 of the proceeds to be used for new-business extensions for electrical service, and $5,000 for street lighting in Johnstown.

SALT LAKE CITY, UTAH.—A New York syndicate has filed articles of incorporation for the Utah Power Company. The incorporators are E. M. Leavitt, of Winthrop, Me., who is president and treasurer of the company; Henry M. Dunning, C. M. Hamilton, William Darbee, William Reiser, C. M. Dahl, Geofrey Kanta, of New York City, and others.

LINDSEY, O.—The village of Lindsey has been granted the right by the Sandusky County Commissioners to erect poles and string wires on the road leading from the Lake Shore Electric right of way on the pike to this village, a distance of two miles. Work on the new electric light plant will be begun at once and will be completed in the early summer. H.

NEWARK, N. J.—The Public Service Electric Company announces in its annual report the acquisition of property on the west bank of the Passaic River, in the meadow section of Newark, as a site for a new electric power plant. The company considers the erection of a large plant to furnish electric light and power to certain sections of Essex and Union Counties, replacing some of its present plants in such territory. A.

DENVER, COLO.—The Western Colorado Power Company has been incorporated with a capital stock of $5,000,000 to operate in several counties in the Western and Southwestern parts of the state. D. E. Wilson, M. A. Lewis and H. B. Teller are named among the incorporators. It is the intention of the company to start construction work in the near future to develop power for the agricultural districts which it will tap.

WINCHESTER, KY.—Plans for the expenditure of $50,000 in improvements in the electric light and power plant here have been completed and will be executed shortly by the Kentucky Utilities Company, of Lexington, which recently secured a franchise from the Clark County Fiscal Court for the extension of its lines through Clark County to Mt. Sterling, Versailles and other points in Clark, Montgomery, Bourbon, Bath and Powell Counties. G.

EAST CHICAGO, IND.—The Northern Indiana Gas & Electric Company, which is controlled by the United Gas Improvement Company, will expend some $750,000 on a new generating station to be erected here. Construction work on the new plant is already under way. This power plant is designed for

an ultimate capacity of 40,000 horsepower, but at present only two units of 6,250 horsepower each will be installed. The first of these is to be in operation by May 1. The company will erect a system of new transmission lines.

DENVER, COLO.—It has been announced that a large New York banking firm has opened negotiations for the purchase of the controlling stock in the Greeley-Poudre irrigation project, embracing 125,000 acres of the richest land in Northern Colorado, with a view to financing and completing it at once. The project includes supplying water through Laramie-Poudre tunnel to develop sufficient electric power for all of Northern Colorado. The Hydro-Electric Company has been formed to handle this part of the work.

HIBBING, MINN.—The Mesaba Light & Power Company, of Virginia, has secured water-power rights on the Vermilion River between Crane Lake and Lake Vermilion and proposes to build several power plants there. It is announced that $5,000,000 of Eastern capital is behind the venture. A. McMillan, of Chicago, one of the officers of the company, has stated that within a year power can be furnished to Hibbing at a cost of but 60 per cent of that necessary to obtaining the present service. The company claims that it will be able to supply electric current for all municipal purposes to a number of the Range cities at a reduction of at least 30 per cent of the present cost.

CLARENDON, VT.—A merger of public utility companies with $20,000,000 capital stock to be known as the Eastern Power & Light Company has been announced and an expenditure of $1,000,000 will be made for extensions and improvements, largely in Southern Vermont and New Hampshire. A 6,000-horsepower plant will be built in this city, with power lines to Wells extending to West Pawlet and Rupert. Another line will extend from Clarendon through Wallingford to Manchester, and still another will be built to Cavendish connecting with a 2,000-horsepower hydraulic plant on the Black River, about a mile south of Cavendish, and extending thence to Springfield. Still another line will be built from Cavendish across the Connecticut River to Claremont, N. H.

CINCINNATI, O.—At a special meeting of the Board of Engineers directed by Congress to determine the feasibility of developing the water power of the Mussel Shoals branch of the Tennessee River, it was decided to advertise for bids for a one-hundred-year franchise. The board found that the Mussel Shoals branch is admirably adapted for water-power development, and that between Decatur and Florence, Ala., it has a primary water power estimated at 100,000 horsepower and a secondary power of another 100,000 horsepower. It was determined that the water power could be developed by means of three dams to be located within a stretch of 20 miles from Florence, Ala. The Government takes the position that it will not build the dams unless those interested are willing to assume a share of the cost. The bids will be asked for to determine what these private interests are willing to pay for the water-power privileges.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

SOUTH PASADENA, CAL.—Bids will be received up to April 28 for a 40-year telephone and telegraph franchise in this city.

RANKIN, OKLA.—Rankin Telephone Company has been incorporated with a capital stock of $5,000 by C. Y. Libby, G. H. Cox and Ira Walters.

EDENTON, N. C.—The Geopim Telephone Company has been incorporated with a capital stock of $10,000 by I. J. Moran, W. E. Hassell and others.

BRANCHVILLE, N. J.—The local telephone company will extend its system from Walpack Centre to Flatbrookville, a distance of about six miles. A.

PORTER, WASH.—Porter Independent Telephone Company has been incorporated with a capital stock of $1,000 by George Ridings, C. A. Turner and others.

GATE, OKLA.—The One Hundreth Meridian Telephone Company has been incorporated with a capital stock of $500 by A. E. Harvey, Otto Stanley and Dillon Brown.

SADDLE RIVER, N. J.—The New York Telephone Company has been granted permission by the Board of Public Utility Commissioners to install and operate a system here. A.

ELTOPIA, WASH.—The Eltopia, Westside Telephone Company was recently granted a franchise for the construction and maintenance of a telephone line extending from this city to the Columbia River. O.

FRESNO, CAL.—The Pacific Light & Power Corporation has been granted a franchise for a telephone line, paralleling a power transmission line from its Big Creek powerhouse to the Fresno-Tulare County line.

MADISON, WIS.—Five Corners Telephone Company has been incorporated with a capital stock of $3,500, with Five Corners named as its place of business. The incorporators are Albert Rohm, Barney Feistel and others.

HAVRE, MONT.—The Farmers Co-Operative Association of Havre has been incorporated by R. L. Field, Isaac Zess, Olaf Norquist and C. L. Brown, all of Havre. The capital stock of the company is $10,000 and the purpose is to build a telephone line.

VANCOUVER, B. C.—Sealed proposals superscribed "Tenders for Forest Branch Telephone Equipment" will be received by the Minister of Lands until April 14 for the following materials: 300 miles No. 9 B. W. G. galvanized iron wire; 10 miles No. 12 B. W. G. galvanized iron wire; 18,000 No. 37, Thomas split tree insulators or equal; 4,125 12-ounce "Brookfield" No. 32 double-petticoat, pony-glass insulators, or equal; 4,125 1.5-ounce, 2-by-12-inch painted oak brackets, conforming to A. T. and T. Company's specifications; 25 coils, 200 feet per coil, No. 18 galvanized seizing strang; 30 standard ground rods. Tenders on above material to be based on price f. o. b. Vancouver, B. C., ready for delivery on May 1, 1913. A certain number of telephones, wall and portable, will also be purchased. For further information address H. R. McMillan, Chief Forester, Forest Branch Department, Victoria, B. C. O.

ELECTRIC RAILWAYS.

(Special Correspondence.)

ATLANTA, GA.—The Georgia Railway & Power Company expects to extend its car line out the Howell Mill Road.

DOVER, DEL.—The Durham Light & Traction Company has been incorporated with a capital stock of $1,000,000 by James M. Satterfield of this city.

CEDAR RAPIDS, IOWA.—The Tri-City Railway & Light Company is completing plans for improvements which will cost $250,000 to be made to its street-railway system in this city.

CALDWELL, IDAHO.—The Caldwell Traction Company proposes to extend its lines around the south side of the Deer Flat reservoir. Enthusiastic endorsement of property owners has been expressed. O.

HILLSBORO, ILL.—The Hillsboro Railway Company has been surveying the proposed route for the extension of its railway from Litchfield, and it is thought that this line will be extended on through Irving and Witt to Nokomis.

TIGARDVILLE, ORE.—The Newberg & McMinnville Electric Railway Company has been petitioned by citizens of this city and the Commercial Club to extend its line to this city. It is practically assured that this will be done. O.

PORTLAND, ORE.—The Portland, Eugene & Eastern Electric Railway Company will begin work of transforming the Southern Pacific's Fourth Street line into an electric line. Cars will be running between Portland and Eugene by July 1. O.

STILLWATER, OKLA.—The Oklahoma Public Service and Interurban Line has secured a mortgage of $4,500,000 to build a system of interurban lines out of this city. The Hudson Trust Company, of New York City, holds the mortgage.

COLDWATER, MICH.—The Battle Creek, Coldwater & Southern Railroad has been granted authority to issue $450,000 of capital stock and it is stated that the company will start work this year on its proposed interurban electric line from Battle Creek and Coldwater.

OWOSSO, MICH.—It has been announced here by W. B. McLaughlin, of Detroit, that definite plans have been made for an electric line from Owosso to Pontiac, with a branch from Fenton to Flint. The road will probably be built from Linden, the source of power, to Fenton and thence to Flint, this year.

ST. PETERSBURG, FLA.—It is stated that Thomas E. Lucas and M. Joel McMullen, of Largo, are interested in a plan to build an electric railroad between St. Petersburg and Indian Rocks, and make a great pleasure resort of the latter. The route for this proposed line is being surveyed by W. W. Barton, of Tarpon Springs.

GRANTS PASS, ORE.—This city recently sold a $200,000 bond issue to Briggs & Slayton, of Toledo, O. The proceeds of same will be used in constructing a municipally owned electric line from Grants Pass to the Illinois Valley, to Crescent City on the coast. Practically all of the right of way has been secured and 26 acres of terminal

grounds in this city have been purchased. O.

SALT LAKE CITY, UTAH.—The use of trackage and terminal facilities jointly by three electric interurban railroads is included in the plans for a new terminal for the Salt Lake & Ogden and the Salt Lake & Utah Railroads. The third electric line to use the proposed terminal will be the Saltair line, the electrification of which is among the plans of the road for the immediate future.

PHILADELPHIA, PA.—Morris Brothers, of this city, who are the principal interests in the Birmingham, Ensley & Bessemer Railway Company, operating electric lines in and around Birmingham, announce that an extension of the road will be constructed from Birmingham to Tuscaloosa, work to begin within a short time. The new line will be 54 miles long from Bessemer to Tuscaloosa.

FORT WAYNE, IND.—The Richmond, Portland & Fort Wayne Railroad has filed articles of incorporation. The capital stock of the company is $100,000 and the incorporators are William F. Harbison, Charles F. Harbison, Richard J. McCarty and Chris H. Frank. It is stated that the new company will build an extension to the interurban line which now connects Fort Wayne and Decatur.

LA SALLE, UTAH.—It is stated that J. M. Cunningham and W. P. Carpenter, who have a ranch of several thousand acres here, are forming a company, which will have a capitalization of $2,000,000, for the purpose of building an electric line from Thompson's Springs to La Salle, a distance of 72 miles. The line will pass through the Big Springs Basin and 150,000 acres of land in the Valley will be put into cultivation. The company will also erect a large power-supplying station on the Grand River, from which the railway will be fed.

ST. JOHN, N. B.—A bill incorporating the Suburban Railway Company has passed the Legislature which makes the way clear for the introduction of hydroelectric power on a large scale, and the construction of suburban lines of railway from St. John in four directions, to Loch Lomond, ten miles, Rothesay, nine miles, Millidgeville, three miles and Westfield, fourteen miles. The bill provides that the company must spend $50,000 in construction work this year, $50,000 next year and $100,000 the third year, besides making provision for hydroelectric power, which, it is estimated, will cost more than $1,500,000. It is stated that there is $10,000,000 behind the proposition.

ASHEVILLE, N. C.—The first steps looking to immense power development in Henderson County, as well as the construction of an interurban line from Hendersonville through Flat Creek and Saluda to a point on Green River, were taken here when petitions were filed in the United States District Court by the Blue Ridge Interurban Railway Company for the condemnation of certain lands and boundaries on the river. The company holds a charter granting it the right to build, own, maintain and operate an interurban railway from Hendersonville, through Flat Creek and Saluda, to a point on the Green River near the mouth of Big Hungry Creek, and to construct a power plant for the supply of electrical power.

PROPOSALS.

INDUCTION AND DIRECT-CURRENT MOTORS.—Sealed proposals will be received at the office of the General Purchasing Officer, Isthmian Canal Commission, Washington, D. C., until April 19 for furnishing induction and direct-current motors, etc., as per Canal Circular 770.

INDUCTION MOTORS, AUTOSTARTERS, ETC.—Sealed proposals will be received at the office of the General Purchasing Officer, Isthmian Canal Commission, Washington, D. C., until April 15, for furnishing induction motors, autostarters or compensators, etc., as per Canal Circular 769.

CONDUITS AND WIRING.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until April 22 for a conduit and wiring system in the United States Marine Hospital, New Orleans, La., in accordance with drawings and specifications, copies of which may be had from the Supervising Architect or from the custodian of the site at New Orleans.

ELECTRIC CONDUITS AND WIRING AND INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until May 6 for furnishing the electric conduits and wiring and interior lighting fixtures of a one-story building for the post office at Iowa Falls, Iowa. Drawings and specifications may be obtained from the Supervising Architect or the custodian of the site.

ELECTRICAL FITTINGS.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until April 22 for furnishing the following electrical fittings, as per Schedule 5,294, copies of which may be obtained from the Bureau.

Article.	Quantity.	Delivery at Navy Yard.
Annunciators, water-tight	5	Brooklyn, N. Y.
Appliances, wiring	Miscellaneous	Eastern.
Bells and buzzers, water-tight	Miscellaneous	Eastern.
Bells and buzzers, nonwater-tight	Miscellaneous	East and West.
Boxes, connection	Miscellaneous	East and West.
Boxes, feeder junction, etc	Miscellaneous	Eastern.
Bushings, insulating	Miscellaneous	Eastern.
Buttons, push	Miscellaneous	Eastern.
Buttons, push, nonwater-tight	200	Philadelphia, Pa.
Buttons, push, water-tight	Miscellaneous	Philadelphia, Pa.
Carbons, arc-lamp, solid	12,000	Philadelphia, Pa.
Controllers, blinker light	2	Brooklyn, N. Y.
Controllers, light, truck, etc	Miscellaneous	Eastern.
Couplings, for night-signal cables	5	Philadelphia, Pa.
Fiber, red and black sheet, etc	Miscellaneous	Eastern.
Fittings, interior	Miscellaneous	East and Puget Sd., Wash.
Fixtures, magazine	Miscellaneous	Eastern.
Fixtures, telegraph engine	Miscellaneous	Philadelphia, Pa.
Fuses, glass tube	Miscellaneous	Eastern.
Fuses, inclosed	Miscellaneous	Eastern.
Fuses, miscellaneous	Miscellaneous	Eastern.
Generators, ohm testing	4	Brooklyn, N. Y.
Guards, nonwater-tight	Miscellaneous	East and West.
Heaters, electric disk	Miscellaneous	Eastern.
Irons, flat, electric	Miscellaneous	East and Puget Sd., Wash.
Irons, soldering, electric	Miscellaneous	Eastern.
Insulators column	Miscellaneous	Eastern.
Lanterns, deck, battle, etc	Miscellaneous	Eastern.
Mica, uncut, pressed plate	Miscellaneous	East and West.
Plugs, water-tight attachment	Miscellaneous	Eastern.
Rings, insulating, hard rubber	Miscellaneous	Eastern.
Rods, hard rubber	Miscellaneous	Eastern.
Rods, zinc, for batteries	600	Norfolk, Va.
Sets, ventilating, portable	Miscellaneous	Eastern.
Sets, searchlight, strips	Miscellaneous	Eastern.
Shades and globes	Miscellaneous	Miscellaneous.
Sockets, keyless, bronze	Miscellaneous	Eastern.
Sockets, key, bronze	Miscellaneous	Eastern.
Tape, cotton and rubber insulating	Annual	East and West.
Terminals, wire	Miscellaneous	Brooklyn, N. Y.
Terminals, wrought copper	Miscellaneous	Eastern.
Tubes, terminal, conduit	Miscellaneous	Eastern.
Wire, fuse	Miscellaneous	Eastern.

NEW PUBLICATIONS.

IGNITION OF MINE GASES.—The Bureau of Mines has issued bulletin No. 52, by H. H. Clark and L. C. Ilsley, entitled, "The Ignition of Mine Gases by the Filaments of Incandescent Lamps." This is a further study of the conditions under which explosive mixtures may be ignited when incandescent lamps are broken.

MAGNETIC OBSERVATIONS.—The Coast and Geodetic Survey has published the results of observations made at the magnetic observatory near Tucson, Ariz., in 1909 and 1910, by Daniel L. Hazard. This includes tables of the hourly values of the different elements of the earth's magnetic fields and also a record of earthquakes and magnetic storms. It gives also a description of the building and instruments used.

COLUMBIA RIVER PROJECT.—The state engineer of Oregon, John H. Lewis, has issued a bulletin on the Columbia River project. This contemplates damming the Columbia River near The Dalles and utilizing the water for generating hydroelectric power on a large scale. The report discusses the engineering features involved, necessary cost, and the possibilities of utilizing the power. The matter is also discussed in the fourth biennial report of the State Engineer to the Governor of Oregon.

UNIVERSAL ELECTRICAL DIRECTORY.—The thirty-second annual edition of the "Universal Electrical Directory," revised for 1913, has been issued by H. Alabaster, Gatehouse & Company, London, England. The directory contains a total of 34,485 names from all parts of the world. These are classified as British, Colonial and General, Continental, and United States. Each division has alphabetical and classified sections. This volume forms a comprehensive collection of the names of manufacturers and users of electrical apparatus, as well as electrical engineers.

FINANCIAL NOTES.

The New York Public Service Commisison has authorized the Elmira Water, Light & Railroad Company to sell $339,000 first consolidated mortgage, five-per-cent 50-year gold bonds to refund a like amount of bonds of the Elmira Water Works Company.

The American Gas & Electric Company, of New York has acquired a controlling interest in the People's Electric Light & Power Company, of Shawnee, Ohio, the Electric Company, of Crooksville, Ohio, and the New Lexington Electric Light Company, of New Lexington, Ohio. The American Company with this purchase now controls the electric light and power companies of Mount Vernon, Coshocton, Newark, Lancaster, Logan, Shawnee, Crooksville and New Lexington.

H. M. Byllesby will be chairman of the board of directors of the new $18,000,000 holding corporation of Louisville Gas & Electric Company. George H. Harries, now president of the Louisville Light Company and the Louisville Gas Company, will be president. The new company will control the Louisville Gas Company, the Louisville Lighting Company, the Kentucky Heating Company and several smaller corporations, and probably the Kentucky Electric Company.

The Knickerbocker Construction Company, of New York, has purchased $900,000 of an authorized issue of $4,500,000 first-mortgage, six-per-cent, 30-year bonds of the Oklahoma Public Service & Interurban Lines Company. It is stated that these bonds will be offered to the public at 90. Proceeds of the bonds will be used to construct an electric line in Logan, Payne, Pawnee and Creek counties, Okla., in the Cushing oil gas district, north and northeast of Guthrie. A power station will also be built at Stillwater. Only $900,000 of the total issue has been issued at present, and additional issues will be made from time to time to pay for extension of lines and other improvements to the property.

The Memphis Street Railway Company, one of the underlying properties of the American Cities Company, has purchased the Lake View Traction Company, of Memphis, which has been in the hands of receivers for some time. The Lake View Traction Company operates about 11 miles of traction line from South Memphis to Lake View, Miss. It has capital stock of $930,975 and funded debt of $367,000. The price paid for the property was $160,000, which is exclusive of the real estate owned in the city, which the Memphis Street Railway Company did not purchase. This real estate is valued at $100,000, and will be sold later and proceeds applied to payment of debts of the company. Purchase price of the Lake View properties will be paid in bonds of Memphis Street Railway Company running 20 years.

The Durham Traction Company, of which W. H. Wright is president and largest stockholder, with its entire interests in Durham, N. C., has been sold to Henry L. Doherty & Co., of New York. The deal carries with it the street railway of about ten miles of tracks, city lighting, ice plant and all of the franchises. The tax valuation of the plant is $284,500. The change takes place immediately.

Dividends.

Associated Gas & Electric Company, a quarterly preferred dividend of 1.5 per cent, payable April 15 to stock of record March 31.

Bell Telephone Company, of Pennsylvania, a quarterly dividend of 1.5 per cent, payable April 15 to stock of record April 5.

Boston Suburban Electric Companies, a quarterly dividend of $1 per share, payable April 15 to stock of record April 2.

Central and South American Telegraph Company, regular quarterly dividend of 1.5 per cent payable April 9 to stock of record March 31.

Mexican Telegraph Company, regular quarterly dividend of 2.5 per cent, payable April 16 to stock of record March 31.

Penn Central Light & Power Company, a quarterly dividend of one per cent, payable April 1 to stock of record March 25.

Washington Railway & Electric Company; a quarterly dividend of 1.5 per cent payable June 1, raising the rate from a four per cent to a six per cent annual basis.

Westinghouse Electric & Manufacturing Company, regular quarterly of 1.75 per cent on preferred and one per cent on common. The preferred dividend is payable April 15 to stock of record March 31 and the common April 30 to stock of record March 31.

Reports of Earnings.

WESTERN ELECTRIC COMPANY.

The report of the Western Electric Company for the year ended December 31, 1912, shows net earnings of $5,710,000, against $4,135,201 in 1911. The balance available for dividends was $4,853,265, equal to 32.36 per cent on the capital stock, as compared with 21.87 per cent earned the previous year. The general balance sheet as of December 31, 1912, shows total assets and liabilities of $62,150,932, against $57,411,815 in 1911. The consolidated income account of the constituent companies for the fiscal year compares as follows:

	1912	1911
Gross sales	$71,727,329	$66,211,975
Other income	1,194,010	337,293
Total income	$72,921,339	$66,549,268
Mfg. costs, exp., etc.	67,211,339	62,414,067
Net earnings	$ 5,710,000	$ 4,135,201
Charges	856,735	854,909
Surplus	$ 4,853,265	$ 3,280,292
Dividends	1,500,000	1,500,000
Reserve	2,000,000	800,000
Employees' benefits	285,855	.....
Surplus	1,067,410	980,292

President H. B. Thayer in his remarks to stockholders says:

"The sales to the companies of the Bell Telephone System did not differ materially from those of 1911, the increase being in sales to other domestic customers and to foreign customers.

"There has been no marked change in conditions affecting our business and the increased sales may be therefore attributed directly to the increased efficiency of the company's personnel and methods.

"Our products are distributed through twenty-eight houses located in the principal cities of the United States and thirty-seven houses located in foreign countries.

"We now have 32,000 customers on our books, of whom about 8,000 are telephone companies and governmental telephone departments. From these customers we received 932,182 orders during 1912, as compared with 881,331 for 1911, the average value of an order for 1912 being $79, as compared with $77 for 1911.

"During the past year additions to the factory plant have been authorized at Antwerp and London, and additional buildings providing 186,000 square feet of floor space are in process of erection at Hawthorne.

"The number of employees on January 1, 1913, was 24,564, as compared with 23,423 on January 1, 1912."

UNION ELECTRIC LIGHT & POWER.

The Union Electric Light & Power Company, of St. Louis, has issued its report for the year ended December 31, 1912. The income account compares as follows:

	1912	1911
Gross revenue	$3,663,821	$3,602,666
Operating expenses, taxes and reserve	1,943,646	1,955,550
Net revenue	1,720,175	1,647,116
Interest and charges	842,928	850,878
Surplus	*877,247	796,238

*Equal to 8.87 per cent on $9,885,000 capital stock, as compared with 8.05 per cent earned on same stock previous year.

FEDERAL TRACTION COMPANY.

The report of the Federal Light & Traction Company for the year ended December 31, 1912, shows net profits of $714,612, against $609,082 in 1911 The income account compares as follows:

	1912.	1911.
Gross	$1,722,647	$1,496,177
Expenses and taxes	1,008,035	887,094
Net	$714,612	$609,082

The total net income of all companies (except Deming Ice & Electric), including other income of $22,446, was $737,058. Out of this was paid $374,540 interest on bonds, notes and floating debt, and $150,000 dividends on $2,500,000 Federal Light & Traction preferred stock, leaving a surplus of $212,517 for the year.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	March 31	March 24
American Tel. & Tel. (New York)	133¼	131¼
Commonwealth Edison (Chicago)	140	140
Edison Electric Illuminating (Boston)	277	276
Electric Storage Battery common (Philadelphia)	49¾	50¾
Electric Storage Battery preferred (Philadelphia)	49¾	50¾
General Electric (New York)	138	136½
Kings County Electric (New York)	129	129
Manhattan Transit New York)	1⅝	1¾
Massachusetts Electric common (Boston)	15	16½
Massachusetts Electric preferred stamped (Boston)	75	74
National Carbon common (Chicago)	115½	115½
National Carbon preferred (Chicago)	115	115
New England Telephone (Boston)	149	144
Philadelphia Electric (Philadelphia)	22⅝	22⅝
Postal Telegraph and Cables common (New York)	81	80
Postal Telegraph and Cables preferred (New York)	65½	65
Western Union (New York)	68	65½
Westinghouse common (New York)	66	62
Westinghouse preferred (New York)	116¼	117

*Last price quoted.

PERSONAL MENTION.

T. N. BOYER, assistant manager, Chicago office General Electric Company, with Mrs. Boyer, spent three days in Seattle recently on his way home from California.

PHIL EICKENBERG, for a number of years connected with the States Electric Company, Chicago, Ill., has been appointed business manager of the Superior Electric Manufacturing Company, Minneapolis, vice T. F. Pike.

JOHN A. BELL, an employee of the Central Union Telephone Company, is one of the heroes who stuck bravely to his wire at Dayton during the horrors of the flood and fire which overwhelmed the city. Although his headquarters were surrounded by flame and flood he kept in constant touch with Governor Cox at Columbus, informing him of every development and sending out appeals for aid.

OLIVER LODGE has been elected president of the British Association for the Advancement of Science, for the meeting in Birmingham this year, in consequence of the death of William White. The sectional presidents for the Birmingham meeting have now been appointed, and J. A. F. Aspinall, general manager of the Yorkshire & Lancashire Railway Company, is chairman of the engineering section.

ANDREW N. FOX, advertising manager of the Benjamin Electric Company, with a wide acquaintance in the electrical field, has been in charge of the entire month's entertainment for the Executive's Club of Chicago. Mr. Fox prepared and carried out a special feature for each meeting as follows: March 7, "The Advertising Agency;" March 14, "The Advertising Publication;" March 21, "The Advertising Specialist;" March 28, "The Advertising Manager."

JOHN W. LIEB, JR., vice-president of the New York Edison Company, with a group of the best electrical engineers in the city, went to Dayton last week to pump out the electric light plant and to get the lights in the city running as quickly as possible. Mr. Lieb is past-president of the American Institute of Electrical Engineers and one of the foremost technical men in this country, and the engineers whom he is taking with him represent the best to be obtained.

CHARLES ROBBINS who, since 1909, has been manager of the Industrial and Power Department of the Westinghouse Electric & Manufacturing Company, has been appointed assistant sales manager of that company, with headquarters at East Pittsburgh. Mr. Robbins became associated with the Westinghouse Electric & Manufacturing Company in 1899 and was for a number of years located in New York city. Previous to his connection with the Westinghouse company he was associated with the Cutter Company, of Philadelphia. He is a member of the National Electric Light Association and the American Institute of Electrical Engineers, having been closely identified with the latter organization in connection with the standardization work, being prominently identified with the Committee on Rating. J. M. CURTIN, who heretofore has been assistant manager of the Industrial and Power Department at East Pittsburgh, has been appointed manager of this Department to succeed Mr. Robbins. Mr. Curtin is a graduate of Penn State College and has been identified with the Westinghouse company ever since his graduation.

ALBERT T. WALCOTT, who was general manager of the Guarantee Electric Company, Chicago, Ill., has joined the selling staff of the Gregory Electric Company, Chicago, and will hereafter be identified with this company. Mr. Walcott is one of the pioneers in the electrical industry, his experience beginning with the old Thomson-Houston Company at Lynn, Mass., in 1881 as an armature winder and later on as an expert in installing machines all over the country for the above company. He was afterward transferred to the Chicago office of the Thomson-Houston Company and was foreman of its Chicago repair shops at 148 Michigan Avenue up to the time of the consolidation with the General Electric Company, after which he was erecting engineer, traveling all over the western states for the General Electric Company, installing their

Albert T. Walcott.

apparatus until 1893, when he was superintendent of the repair shops of the Chicago Edison Company at Market and Washington Streets, where he remained until 1897, becoming then superintendent of the Guarantee Electric Company, being with the latter company 15 years, finally as general manager. Mr. Walcott has also had considerable central station experience, managing a number of central stations during the above period, and has a very wide acquaintance.

OBITUARY.

CHARLES E. WILSON, general manager and director of the Keystone Telephone Company, Philadelphia, Pa., died there last week from pneumonia. He had been ill for several months. Mr. Wilson was a prominent independent telephone man, and was 45 years of age at the time of his death.

JOHN CASHMAN, president of the Quincy (Mass.) Light and Power Company, died March 27 at his home in that city. He had been a contractor for nearly 50 years, having built many important bridges and breakwaters. He was owner of the Bay State Dredging Company, an important marine contracting concern. Mr. Cashman was born in Ireland in 1849, coming to this country at an early age.

NEW INCORPORATIONS.

PHILADELPHIA, PA. — People's Heat, Light & Power Company has been incorporated with a capital stock of $500,000 by Thomas F. Barry, of this city.

BOSTON, MASS. — The Royal Transmitter Company has been incorporated with a capital stock of $10,000 by Floyd H. Ogden, Daniel McMillan and John T. Holmes. W.

STIGLER, OKLA.—Stigler Electric Light & Power Company has been incorporated with a capital stock of $15,000 by J. N. Ward, F. N. Ward and Claud C. Ward.

SEBREE, KY.—Sebree Light & Milling Company has been incorporated with a capital stock of $20,000 by John R. Ramsey, J. B. Ramsey, J. J. Korb and M. J. Ramsey.

WILMINGTON, DEL.—Pennsylvania Electric Company has been incorporated with a capital stock of $25,000 to deal in bonds and securities. Herbert J. Latter, of this city, is named as the incorporator. N.

PHILADELPHIA, PA.—Snook-Roentgen Manufacturing Company has been incorporated with a capital stock of $300,000 to manufacture X-ray apparatus. F. R. Hansel, of this city, is named as the incorporator. N.

ANDERSON, IND.—United States Electric Company has been incorporated with a capital stock of $10,000 for the purpose of manufacturing electrical devices. The directors are Frank P. and Martin Dunn, and George P. Louiso.

SHOALS, IND.—Shoals Electric Light Company has been incorporated with a capital stock of $10,000 to operate an electric plant. The directors are John T. Morris, Charles O. Williams, Benjamin C. Johnson, Stephen A. Street, Fabius Gwin and others.

ST. LOUIS, MO.—The Behr Electrical Contracting Company has been incorporated with a capital stock of $6,100 by Charles B. Behr, Aaron A. and Rose B. Behr. The company will manufacture, buy, sell and deal in electrical machinery, appliances, etc.

WILLIAMSTOWN, KY.—The Williamstown Mill & Light Company has been incorporated with a capital stock of $15,000 by J. M. Riley, J. W. Shields, R. I. Webb, W. P. Stratton and G. S. Webb. The company will operate an electric plant and engage in grinding grain of all kinds.

PITTSBURGH, PA.—Applications for charters will be made for the McKeesport, Versailles, Turtle Creek, Wall, Clairton, Millvale, East Pittsburgh, Shaler, Sharpsburg, Pittsburgh Standard, West Homestead, Homestead, Munhall, Indiana, Spring Garden, North Braddock, Pitcairn, Wilson, Etna, Glassport, Rankin, Hays, Trafford, Braddock, Swissvale, Duquesne, South Versailles, Reserve, Verona, East McKeesport, Edgewood, Wilkinsburg, Patton, Wilkins Township, Braddock Township, Mifflin, Penn, Oakmont, Wilmerding, Whitaker, Port Vue and North Versailles Standard Electric Companies. N.

DATES AHEAD.

National Supply and Machinery Dealers' Association, the Southern Supply and Machinery Dealers' Association and the American Supply and Machinery Manufacturers' Association.

Joint convention, Indianapolis, Ind. April 10-12.

Tri-State Water and Light Association. Annual convention, Charlotte, N. C., April 15-16.

Missouri Electric, Gas, Street Railway and Waterworks Association. Annual convention, Kansas City, Mo., April 17-19.

American Institute of Electrical Engineers. Pittsburgh, Pa., April 18-19.

Mississippi Electric Association. Annual convention, Natchez, Miss., April 21-23.

Iowa Electrical Association. Annual convention, Waterloo, Iowa, April 23-24.

Iowa Street and Interurban Railway Association. Annual convention, Waterloo, Iowa, April 23-25.

American Physical Society. Spring meeting, Washington, D. C., April 25-26.

Oklahoma Electric Light, Railway and Gas Association. Annual convention, Oklahoma City, May 6-8.

Order of Railroad Telegraphers. Baltimore, Md., May 13.

The Society for Electrical Development, Incorporated. Annual meeting, New York, N. Y., May 13.

National Fire Protection Association. Annual meeting, New York, N. Y., May 13-15.

Association of Railway Telegraph Superintendents. Annual meeting, St. Louis, Mo., May 20.

Southwestern Electrical and Gas Association. Annual convention, Galveston, Tex., May 21-24.

Electrical Supply Jobbers' Association. Spring meeting, Chicago, Ill., May 26-28.

National District Heating Association. Fifth annual convention, Indianapolis, Ind., May 27-29.

National Electric Light Association. Annual convention, Chicago, Ill., June 2-5.

Canadian Electrical Association. Annual convention, Fort William, June 23-25.

Electrical Contractors' Association of the State of Missouri. Annual meeting, St. Louis, Mo., July 12.

National Electrical Contractors' Association. Annual meeting, Chattanooga, Tenn., July 16.

Michigan Section, National Electric Light Association. Annual convention, Ottawa Beach Hotel, Ottawa Beach, Mich., August 19-21.

With the Electrical Manufacturers

The Naugle Pole & Tie Company, 5 South Wabash Avenue, Chicago, Ill., has reprinted the Northwestern Cedarmen's Association specifications, revised to January 1, 1913. These specifications will be sent to those interested, with the compliments of the Naugle Company.

Kerr Turbine Company, Wellsville, N. Y., has issued an interesting little booklet entitled "A Little Journey to the Home of the Economy Turbine," written by Elbert Hubbard as a result of a visit to the works of the company. A copy of the booklet will be sent upon request to the company.

Mohrlite Missouri Company, 809 Oak Street, Kansas City, Mo., is distributing a booklet illustrating the use of the "Mohrlite System" of indirect lighting. In this system the reflecting and diffusing surfaces form part of the fixtures, and it is claimed that high efficiency can be obtained regardless of the color or other characteristics of the ceiling and walls. The units are placed close to the ceiling.

The Triumph Electric Company, Cincinnati, O., has recently received visits from two delegations of students of technical schools. On March 19 a class from the State University of Kentucky was conducted through the shops, and on March 21 students from the Case School of Applied Science paid their annual visit. Particular interest was shown in the Triumph reversing planer motor, the party later visiting the shops of the Cincinnati Planer Company.

The Superior Electric Manufacturing Company, Minneapolis, Minn., will largely increase the output of its factory and make a number of changes in design of its panel boards. Special arrangements will be made to take care of all orders in the northwestern territory, and throughout western Canada. Phil Eickenberg, for a number of years connected with the States Electric Company, Chicago, Ill., has been appointed business manager.

The Connecticut Telephone & Electric Company, Meriden, Conn., has ready for distribution a new bulletin devoted to Connecticut electric reset annunciators for elevator, hotel office, hospital, restaurant, telephone and return-call use. The bulletin describes every detail of the apparatus, and gives complete information with regard to annunciators for various service, together with description of fittings and list prices.

Dodge Manufacturing Company, Mishawaka, Ind., has an article in the *Dodge Idea* for March regarding the use of benefit funds among factory employees. The company has been carrying on an investigation among concerns which have employees' relief associations and is publishing the collected information for the benefit of those interested. The company is anxious to get the co-operation of all who can add any facts to this compilation.

Pass & Seymour, Incorporated, Solvay, N. Y., has published a very handsome bulletin describing the Shurlok locking socket. This booklet details in a vividly interesting manner a great many instances appertaining to the utilization of locking sockets for the protection of incandescent lamps and circuits. This booklet should be in the hands of every central station, jobber and contractor for the valuable material it contains, and will be sent to those interested upon request.

American Carbon & Battery Company, 509 Olive Street, St. Louis, Mo., has added to its already extensive lines of both wet and dry batteries a new line of flashlight batteries. These are given the trade name "American Radium Batteries," and are made in a variety of shapes and include various numbers of cells from two up to five. Although made particularly for use with flashlight outfits they are also serviceable for other similar purposes requiring a very compact and light-weight battery.

Allgemeine Elektricitäts Gesellschaft, Berlin, Germany, has issued two new bulletins, of which one is devoted to the use of steam-turbine-driven pumps for waterworks. A number of typical installations of such equipment are described in considerable detail and with the aid of numerous half-tone and line illustrations. Data respecting these are also included. Another bulletin describes porcelain junction blocks for tapping main-line risers at different floors in conduit-wired buildings. A large variety of these blocks are made suitable for two, three or four-wire circuits. The bulletin describes and illustrates these and gives all necessary data for their use.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., reports the receipt of an order from the West Penn Traction & Water Power Company for two 19,000-kilovolt-ampere Westinghouse-Parsons turbo-alternators. When installed, these will be the largest generating units in the Pittsburgh district. The West Penn Company has recently taken over the Wheeling Traction Company, Wheeling, W. Va., and expects to make very extensive improvements in the power houses at Wheeling and at Connellsville, and also in its distribution lines. The two power houses mentioned in connection with the water-power development at Sheat Haven, W. Va., will form one of the largest electric systems in the country.

H. T. Paiste Company, Philadelphia, Pa., has recently made a number of important changes in its line of Pipe Taplets so as to more thoroughly standardize these well known conduit fittings. In order to minimize the amount of stock required to be kept on hand by dealers, greater interchangeability of material has been made possible by certain changes in the sizes of wire openings so that now only three sizes of Pipe Taplet covers are needed for all types of these fittings. The first size

of fittings and covers fits all 0.5 and 0.75-inch Pipe Taplets; the second size fits all 1.0 and 1.25-inch Taplets; the third size fits all 1.5 and 2.0-inch Taplets. This has made it necessary to keep only about one-half the stock of covers and fittings formerly required. These changes do not affect in any way the size and design of the opening in the 0.5 and 0.75-inch sizes and these will fit the standard Fielding receptacles and rosettes, which have been so generally used in wooden molding wiring. The company believes that this combination of the smaller Pipe Taplets and Fielding receptacles is the most flexible and economical form for either lamp or cord outlets. A new catalog of Pipe Taplets is in preparation and will be sent upon request to all interested.

Record of Electrical Patents.

Issued by the United States Patent Office, March 25, 1913.

1,056,789. Apparatus for Producing Ozone. S. Held, assignor to National Air Filter Co., Chicago, Ill. Includes an electric ozonator and an electric fan.

1,056,830. Treatment of Gases. H. D. Rankin, Joliet, Ill., assignor to American Nitrogen Co. The gases are subjected to the action of an electric arc.

1,056,850. Welding Machine. F. A. Stevens and S. E. Bouchard, Providence, R. I. One of the electrodes can be moved toward and away from the work.

1,056,852. System of Control. N. W. Storer, assignor to Westinghouse Electric & Manufacturing Co. Includes liquid rheostats through which electrolyte is continuously circulated.

1,056,854. Rail Bond. C. R. Sturdevant, assignor to American Steel & Wire Co. Consists of a flexible conductor with one end fastened to the rail and the other to the splice bar.

1,056,862. Electric Fuse. M. C. Warren, Coffeyville, Kans. Melting of the fuse causes an insulating block to drop between the terminals.

1,056,866. Circuit-Changing Mechanism. H. G. Webster, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. A telephone-switchboard electromagnet.

1,056,869. Malt-Turning Machine. D. D. Weschler, Milwaukee, Wis. Has reciprocating shovels and is electrically operated like a traveling crane.

1,056,878. Recording Apparatus. L. M. Aspinwall and G. Bright, assignors to Westinghouse Electric & Manufacturing Co. A moving-picture camera has the light flashed on each time the film reel is retarded.

1,056,879. System of Electric-Motor Control. G. Baehr, assignor to Westinghouse Electric & Manufacturing Co. Electromagnetic control for a direct-current motor with alternating-current collector rings.

1,056,892. Apparatus for Producing Tone Effects in Wireless Telegraphy. M. Eastham, assignor to Clapp-Eastham Co., Cambridge, Mass. The spark gap is formed between two relatively parallel, revolving disks with salient segments.

1,056,893. Method of Producing Tone Effects in Wireless Telegraphy. M. Eastham, assignor to Clapp-Eastham Co. High-frequency oscillations are divided into groups having an acoustically suitable frequency independent of that of the generator.

1,056,894. Locomotive Driving Connection. K. F. Elers, assignor to Westinghouse Electric & Manufacturing Co. Provides flexible connection between motor and driving wheels.

1,056,900. Process of Desulfurizing Ores and Metals. A. E. Greene, assignor to American Electric Smelting & Engineering Co., St. Louis, Mo. Pig iron is melted with a lime slag and reducing agent in an electric furnace.

1,056,908. Adjuster and Support for Electric Lamps. J. W. Kea, Monroe, La. A cord adjuster made out of a single piece of wire.

1,056,921. System of Control for Dynamo-Electric Machines. J. N. Mahoney, assignor to Westinghouse Electric & Manufacturing Co. A modification of the type of control described in No. 1,056,852, this including a main and an auxiliary reservoir.

1,056,933. Electric Cooker. F. C. Perkins, Buffalo, N. Y. A double-walled chamber contains a thermostatically controlled heating element.

1,056,946. Automatic Water-Level Alarm. S. Q. Saunders, New Bridge, Oreg. A float controls electric alarm signals.

1,056,951. Fire-Alarm. R. E. Sherer, Luck, Wis. Melting of a fuse opens a relay circuit and thus closes the alarm circuit.

1,056,987. Electric Curling-Iron. A. C. Gough, Pocatello, Ida. Relates to the construction of the heating elements.

1,056,992. Electric Semaphore Mechanism. W. K. Howe, assignor to General Railway Signal Co., Gates, N. Y. Includes a motor and control therefor.

1,056,993. Alternating-Current Track-Circuit Signaling. W. K. Howe, assignor to General Railway Signal Co. The signal circuits are connected through transformers to the source.

1,056,995. Electrical Testing Apparatus. H. G. Ingram, Juniata, Pa., assignor of one-half to S. Goldberg. A head telephone receiver contains a reel for winding up the connecting cord.

1,056,998. Insulator. B. G. Jamieson and C. A. Keller, Chicago, Ill. A busbar is held in a compartment by bolts with heads incased in insulation, that bears against the bar.

1,057,005. Portable Electrically Operated Tool. C. W. Miles, Anderson Township, O. A motor is mounted on the tool carriage.

1,057,008. Automatic Magnet-Winding Machine. E. R. Phillips, East Providence, R. I. Includes a slowly reciprocating wire-guiding arm to give the proper pitch.

1,057,009. Spark-Producing Mechanism for Internal-Combustion Engines. L. T. Rhoades, Mont Clare, Fa. Has a special primary interrupter.

1,057,016. Electrode. K. Tornberg, assignor to General Electric Co. A luminous-arc electrode with a metallic shell.

1,057,024. Liquid-Mixer. J. J. Wood, assignor to General Electric Co. A drink-mixer driven by a vertical motor.

1,057,025. Lamp Socket. G. Wright, assignor to General Electric Co. The shell has pockets engaged by projections on the porcelain base.

1,057,035. Selective System. E. R. Carichoff, assignor to General Electric Co. A 600-1,200-volt direct-current car has an automatic switch to throw the lighting circuit directly across the 600-volt line or onto a dynamotor for changing 1,200 to 600 volts.

1,057,038. Railway Signaling Apparatus. W. J. Cook, Denver, Colo., assignor to Cook Railway Signal Co. An electromagnetically controlled semaphore.

1,057,041. Mercury-Lamp-Starting Device. J. T. H. Dempster, assignor to General Electric Co. Each of the lamps operated in series has a shunt adjusted to prevent simultaneous starting of the lamps.

1,057,045. Variable-Speed Electric Drive for Planers. A. D. Du Bois, assignor to General Electric Co. Contact devices are arranged along the planer bed to throw resistance in the motor field during the return stroke.

1,057,046. Electrode. G. W. Elmen, assignor to General Electric Co. An arc-lamp electrode consisting of a metallic tube containing iron oxide, rutile, chromite and 0.25 per cent of sodium fluoride.

1,057,049. Railway Signal. H. L. Funkhouser, Beaver Falls, Pa., assignor of one-eighth to W. J. Thornton. Colored lamps in the locomotive cab are controlled by track-tappet-operated switches.

1,057,054. Arc-Lamp Electrode. C. A. B. Halvorson, Jr., assignor to General Electric Co. The arc-producing filler is inclosed in two concentric iron tubes.

1,057,056. Bait for Drawing Glass Articles. H. F. Hitner, assignor to Pittsburgh Plate Glass Co., Pittsburgh, Pa. Includes a high-resistance ring electrically heated to maintain its temperature.

1,057,061. Rotor Winding for Alternating-Current Dynamo-Electric Machines. L. J. Hunt, assignor to General Electric Co. Provides two different numbers of poles for cascade working.

1,057,077. Transformer. W. S. Moody, assignor to General Electric Co. One of the coils is subdivided by means of taps and a drum-type controller is arranged to cut out one after another.

1,057,082. Electrical Reduction Furnace. H. H. Noble, San Francisco, Cal. The electrodes project into the crucible through arch covers adjoining a stack.

1,057,088. Shaping Filaments. R. O. Poag and W. W. Kirk, assignors to General Electric Co. A winding machine for forming helical filaments.

1,057,126. Electrical Protective Apparatus. A. F. Dixon, assignor to Western Electric Co. Arrangement of spark-gap arresters and heat coils for a distributing frame.

1,057,147. Electric Switch. H. Hansen, assignor to Francis Keil & Son, New York, N. Y. Has a push-button attached to each end of the rocking member.

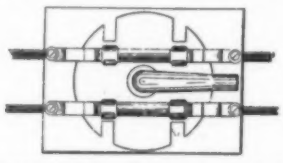
1,057,155. Electric Switch and Cutout. J. S. Johnston, assignor to Johnston Manufacturing Co., Utica, N. Y. The fuse carrier is a rotatable block with fuse clips and knife edges engaging stationary horizontal blades; the block can be turned 90 degrees and lifted off the base.

1,057,176. Electric-Lamp Socket. F. E. Seeley, assignor to Perkins Electric Switch Manufacturing Co., Bridgeport, Conn. A key socket of special construction to give ready access to the securing screws.

1,057,178. Cable-End Bell. E. O. Sessions, Chicago, Ill., assignor of one-half to F. Woodmansee. Includes a sealed casing with a tapering block engaging the lead sheath of the cable.

1,057,179. Sleet-Cutter. C. J. Smith, Altoona, Ia. A trolley wheel with cutting edges and ice-piercing points.

1,057,184. Insulating Means. L. Steinberger, Brooklyn, N. Y. Consists of concatenated flexibly connected suspension sections.



1,057,155.—Rotary Switch and Cutout.

1,057,186. Spark-Intensifier for Spark Plugs. E. Stirnkorb, Fort Wayne, Ind., assignor of one-half to L. C. Gerwig. Includes an insulating shield, a glass tube and screw plug.

1,057,213. Electric Furnace and Method of Operating Same. G. H. Benjamin, New York, N. Y. Has a number of electrodes and heating, reducing and refining chambers.

1,057,216. Transmission Tower. F. M. Bowman and A. H. Bovard, assignors to Riter-Conley Manufacturing Co., Pittsburgh, Pa. A latticed-steel tower with cantilever crossarms and a central mast on each.

1,057,239. Electric Furnace. A. Helfenstein, Vienna, Austria-Hungary. Has a number of communicating reduction chambers with an electrode in each.

1,057,258. Electric Switch and Outlet Box. O. Moessner, Philadelphia, Pa. The box is made of abutting sections with interlocking clips and claws.

1,057,261. Apparatus for Indicating the Position of Moving Bodies. H. R. Norton, New York, N. Y. A level-indicator with contact blocks, resistances, a moving contact and a galvanometer.

1,057,266. Pneumatic-Despatch-Tube Apparatus. A. W. Pearsall, assignor to Lamson Co., Newark, N. J. A motor drives the air pump and can be controlled from any station.

1,057,276. Electrical Measuring Instrument. L. T. Robinson and O. Holz, assignors to General Electric Co. A form-factor indicator for alternating-current circuits.

1,057,278. Art of Synchronizing Alternating-Current Generators. B. P. Romain, assignor to Weston Electrical Instrument Co., Waverly Park, N. J. Includes a synchronizing lamp and a rotatable indicating object.

1,057,279. Apparatus for Use in the Treatment of Deafness. A. Rosenberg, London, Eng. Electromagnetically produced mechanical vibrations are impressed on the ear.

1,057,282. Hair-Drying Apparatus. A. Schaeffer, Frankfort-on-the-Main, Germany. An electrically driven blower with the air warmed by passing through the motor.

1,057,286. Revolving Electrical Furnace with Resistances Arranged Diametrically. O. Serpek, assignor to Société Generale des Nitrures, Paris, France. The resistances are in sections with beveled edges.

1,057,313. Alarm Device for Measuring Instruments. S. Worliczek, Zolkiew, Austria-Hungary. An electric-alarm attachment.

1,057,184.—Suspension Insulator.

1,057,320. Electric Socket. F. Barr, New York, N. Y. A keyless socket with doubly flanged insulating body.

1,057,324. Scale Attachment. W. N. Briggs, Raleigh, Tenn. The scale pointer is connected to an electric alarm.

1,057,333 and 1,057,334. Method of Attaching Rubber to Metals. L. Daft, Rutherford, N. J., assignor to Electro-Chemical Rubber & Manufacturing Co. The object is first electroplated with one or more metals.

1,057,367. Electric Water Purifier. A. P. H. Van Pelt, Los Angeles, Cal. Has horizontal disk and spider electrodes.

1,057,370. Electric Fuse-Lighter. H. Bargman, assignor to International Fuse Lighter & Electric Manufacturing Co., Los Angeles, Cal. Has two contact points which glow on the passage of current.

1,057,383. Electrical Appliance for Actuating and Controlling Dumb-Waiters. C. H. Larson, New York, N. Y. Push-button automatic control for an electric motor.

1,057,386. Dynamo-Electric Machine. E. M. Tingley, assignor to Westinghouse Electric & Manufacturing Co. Special ventilation for a turbine-driven generator.

1,057,394. Electric Motor. H. C. Ogle, Dexter City, O., assignor of one-half to L. Stevens. The controller is mounted on the end of the motor shaft.

Patents That Have Expired.

Following is a list of electrical patents (issued by the United States Patent Office) that expired March 31, 1913.

557,099. Multiple-Series System of Electrical Distribution. F. B. Badt, Chicago, Ill.

557,139. Rail Bond and Electrical Connector. C. E. Moore, Chicago, Ill.

557,153 and 557,154. Apparatus for Telephone Lines. C. E. Scribner, Chicago, Ill.

557,159. Electrical Dental Plugger. P. R. Skinner, Oneonta, N. Y.

557,164. Electric Meter. C. P. Steinmetz, Schenectady, N. Y.

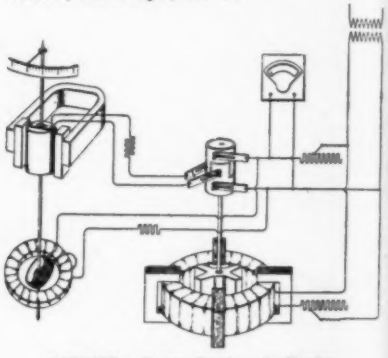
557,185. Regulating Electric Motors. J. Burke, Newark, N. J.

557,218. Commutator for High-Voltage Dynamos. A. J. Oehring and H. H. Wait, Chicago, Ill.

557,224. Electric Switch. C. O. Perkins, Hartford, Conn.

557,229. Electric Arc Lamp. W. D. Ray, Chicago, Ill.

557,257. Electric Cutout. R. G. Davis, Brooklyn, N. Y.



1,057,276.—Form-Factor Indicator.

557,258. Electric Railway. P. B. Delany, South Orange, N. J.

557,282. Electric Car-Heater. J. G. Noyes, Milford, Conn.

557,284. Telephone Switch and Support. E. C. Paramore, Philadelphia, Pa.

557,324. Art of Electric Dyeing. G. D. Burton, Boston, Mass.

557,325. Art of, and Apparatus for, Electrodyeing. G. D. Burton.

557,326. Art of, and Apparatus for, Electric Dyeing and Shrinking. G. D. Burton.

557,342. Shade for Incandescent Electric Lamps. S. O. Richardson, Jr., Toledo, O.

557,355 and 557,356. Galvanic Battery. E. S. Boynton, Brooklyn, N. Y.

557,384. Fan Motor. R. H. Hassler, Dayton, O.

557,386. Rheostat. H. E. Heath, Windsor, Conn.

557,398. Distribution of Electric Currents. I. Kitsee, Philadelphia, Pa.

557,403. Electric Flash-Light Apparatus. G. R. Lawrence, Chicago, Ill.

557,422. Means for Transmitting Electrical Energy. T. W. Onderdonk, New York, N. Y.

557,434. Electrical Lighting Apparatus. R. A. Schoenberg, J. W. Flucker and A. N. Keedwell, New York, N. Y.

557,442. Trolley for Electric Railways. H. A. Seymour, Washington, D. C.

557,497. Electric Gate-Operating Mechanism. F. J. Dyett, Ilion, N. Y.

557,527. Switchboard Signal. I. H. Farnham, Wellesley, Mass.

Electric Vehicle Section

Central-Station Public Garage.

Consolidated Gas, Electric Light & Power Company, Baltimore, Md., Has Organization for Selling, and Facilities for Maintaining Vehicles that It Sells, and Systematically Promotes the Use of Electric Wagons.

By William W. Scott.

(Reprinted by Courtesy of Motor Truck, Pawtucket, R. I.)

A striking example of the possibilities of co-operation and the results accomplished through a public service afforded at its garage is the development of electric vehicle use in Baltimore, Md., where the Consolidated Gas, Electric Light & Power Company has inaugurated a systematic campaign of general promotion. The company has taken up the electric vehicle as a means for insuring the sale of current and has by progressive methods achieved a large measure of success. The company has formulated a policy that is in keeping with its progressiveness, and it has the agency of the General Vehicle Company for that city and vicinity. That is, the company has realized the need of stimulative and promotive endeavors and has organized a division that is devoted not only to the sale of vehicles, but it is affordnig a service that will make it possible for the man who owns a single machine to operate it at the same relative economy as the concern that possesses a large number.

The commercial department of the company is devoted to the promotion of the sale of electric energy for varying purposes, and included in this is the agency for the vehicles and the administration of the garage. The garage is at 30 South Eutaw Street, where service is given for 48 machines aside from the company's electric transportation equipment. The company uses 21 machines and has three more ordered which will shortly be delivered. Two years ago the company had no electric vehicles and it was decided to utilize a number, the first order being for six. This necessitated the inauguration of an electric garage. The possibilities of an agency for machines were considered and believed to be such as to justify the company adding this to its regular business.

In establishing a garage, provision was made for storing and serving about 100 machines, and a power house was turned over to the department by the company.

In considering the sales agency and garage department of this company it is proposed to follow sequentially the sale and use of vehicles, giving the forms of records used and the organization that is necessary to afford the service the company has established. The department is under the management of Douglass Burnett, executive of the commercial department, and the garage is managed by Harrison W. Wagner, who is assisted by a salesman in the agency department. These two men devote themselves to the exploitation of the machines, Mr. Wagner giving whatever time is necessary to the supervision of the garage.

The sale of an electric vehicle is consummated by the acceptance by a purchaser of a proposal, which is made on a regular form, this requiring the delivery f. o. b. at Long Island City, N. Y., of a specified chassis and body, the terms being the payment of 25 per cent upon execution of the contract and the remainder upon delivery. The vehicles are sold under the standard warranty of the manufacturer, but the company, acting as sales agent for the General Vehicle Company, guarantees to protect the purchaser under the warranty and on its own behalf, independently of the General Vehicle Company, and agrees to maintain in good running order for a period of one year from date of purchase the batteries and motors of all vehicles kept at the company's garage and operated normally according to the company's instructions. But the company does not accept any responsibility in connection with any vehicles when they have been altered or repaired outside of the company's garage, in cases where the machines are kept at the company's garage. It is also stipulated that when experts are furnished by the company for instruction purposes, they shall, while so employed, act solely at the risk and as agents of the purchaser. There are clauses which specify the company shall not be liable for consequential damage and for delays beyond the reasonable control of the company, and that the proposal is not binding unless accepted within 15 days of submission. There is also a provision that the proposal constitutes in all respects the agreement between the parties and no modification shall be binding unless it shall be executed by the purchaser and approved by the company.

The purchase having been made the garage service of the company is open to the purchaser under yearly contract. This contract states the following prices for the differing types of vehicles:

Capacity, Vehicles of General Vehicle Co.	No. of Battery, Plates a Cell.	Washing, Oiling, Inspection. Storage,	Monthly Charge for Current for Charging Each Battery.	Current for Charging Each Spare Battery.	Extra Battery Charging an Hour for Extra Charges for Make Additional Mileage.
700 lbs.	9 G. V.	$15	$10	$10	10c
1,000 lbs.	11 G. V.	18	12	10	12c
2,000 lbs.	15 G. V.	22	14	10	14c
4,000 lbs.	17 G. V.	26	19	10	19c
7,000 lbs.	21 G. V.	30	29	10	29c
10,000 lbs.	25 G. V.	30	29	10	29c

For repairs it is stipulated that an extra price will be made for all repair labor and material, according to the work done and the supplies furnished, except such maintenance of batteries and motors as may be furnished without extra charge under the contract covering the sale of the wagons.

The company will store, wash, oil and inspect electric power wagons sold by it and manufactured by the General Vehicle Company, and any extra batteries used with them, as listed above, and will furnish the electric charging of the machines. It will furnish electric current and will charge each battery in each wagon after the return from the day's work, using due diligence to make full charges, it being understood that at least eight hours is required for a full charge, according to the prices given. The company will furnish extra battery charges for additional mileage within any 24 hours at notice from the customer or his driver at the prices stated, the current to be supplied at not to exceed twice the normal charging rate (it being stated that each hour's charge so given should add about 20 per cent to the day's mileage). The company agrees to furnish competent attendants and supervision over the operation and maintenance of the batteries and wagons while at the company's garage. It will also keep on file at its garage records of the mileage, charging current and inspections of all vehicles kept at its garage, which records are open to inspection by the owners of such vehicles. The company specifies that it does not insure the vehicles of customers, that it shall not be liable for any loss, damage, or expense occasioned by its failure to supply electric current for any cause save willful neglect or default; that it shall not be liable for consequential damage, and that from the failure of the customer to comply with the provisions of the contract, or terms or conditions, or default of payment for service beyond 30 days, it may discontinue the service without incurring liability for any loss or damage. The contract specifies the number of vehicles and extra batteries to be cared for, and service is begun at noon of a given day and continues for a year, the bills to be payable monthly 10 days after rendition, and are to be sent to a stated address. When the service specified by the contract has been used for more than a year the contract may be terminated in 10 days by written notice from either contractor. The contract is not modified unless such modification is in writing and attached thereto.

The contract has been dealt with to considerable length from the fact that it calls for a year's service, and after that time it may be continued an indefinite period, terminable at 10 days' notice. This differs from the usual custom of garages, which is generally a monthly rate and for no stated period. While the charge for current is, according to the contract, a flat rate for a given capacity of vehicle, the American Express Company, which keeps its fleet of 25 machines at the garage, pays for the current used on the basis of kilowatt-hours, for which a charge is made of four cents a kilowatt. It will be seen, however, that under the contract the company will fully charge the batteries after each day's use.

The service of the garage is standard and it is admirably systematized. The organization includes Manager Harrison W. Wagner, his assistant in the sales department, a clerk, a garage foreman, day and night switchboard men, head battery man, assistant battery man and two helpers; three men who water batteries and oil and grease the wagons, day mechanic and helper, night mechanic and helper, two washers and a porter. The day "crew," outside of the office, consists of a foreman, switchboard man, battery man, assistant batteryman, mechanic and helper, and a battery man who works from 2 in the afternoon until 11 at night; the night "crew" includes a switchboard man, battery man, mechanic and helper, the helpers who water batteries and oil and grease, and two washers.

In the contract of sale of vehicles the company undertakes to give attention to the batteries and motors for a period of a year, and to insure the care necessary in charging what is known as a battery charging sheet is posted in the garage. This specifies the vehicles kept at the garage and the size and type of the batteries and the charging rate for each. It is necessary that this instruction be followed implicitly, and the order is signed by the garage manager and approved by the manager of the commercial department.

This sheet is signed by the manager of the garage and approved by the manager of the commercial department. This is not to be varied from under any conditions without the sanction of both garage and department heads. The expectation is to insure a uniform service with reference to the batteries. The methods of the company are thorough and have been carefully developed.

In describing the service of the garage it should be stated that the care and attention do not differ, no matter what the vehicle, although there is of necessity a variance in the character of record, because, in the case of the American Express Company, additional reports are required by that concern. When the contract has been made and the machine is in use each driver is required to make out a report on the "Driver's Report" card, this stating the number of the wagon, the date, the time of leaving and returning to the garage, the odometer reading for the morning and afternoon work, and a brief report on the condition of the machine, this indicating any attention that may, in the judgment of the driver, be required. This is signed and deposited at the garage office. All these cards are examined by the garage foreman, who determines the repairs or adjustments, if any, and from the mileage whatever instruction may be desired with reference to charging.

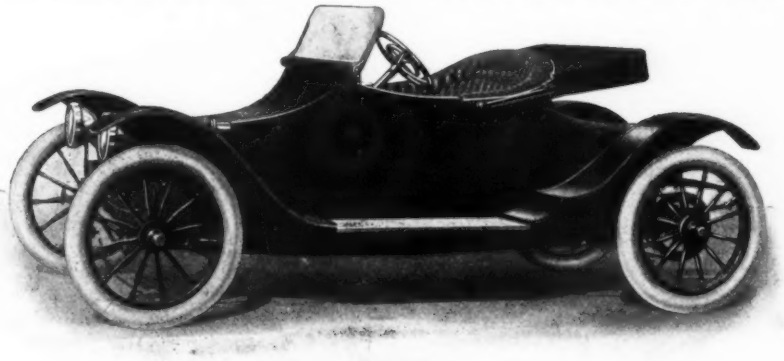
That there may be no possibility of error all of the orders for repairing, adjusting and special charging instructions are noted on a "Daily Repair and Charging Instruction Sheet" and this is posted in the garage. This gives the number of the wagon, the nature of the repair or the charging direction, and when either or both attentions have been given the initials of the man or men performing the work are entered as an evidence of completion and establishing responsibility. The work required by this sheet is completed and the signature of the night foreman is assurance that the instructions have been followed.

When the machine is driven in from the day's work the driver makes out his report. The vehicle is then placed on the washstand, which will accommodate three, and when washed it is sent to the space assigned to it and charging is begun. Meantime the driver's report has been examined and the daily instructions made out. The work required is performed systematically, and in addition the battery is "watered" and the oil and grease cups filled. Incidentally the vehicles are examined while being worked on by the washers, oilers and battery men, and should there be occasion a report is made to the garage foreman or the night mechanic. The machines are always looked over in a general way if work is being done upon them, and regularly an inspection is made to determine their condition. It will be seen that there is little probability of any defect or condition that might cause damage or failure escaping attention.

If machine work of a character that cannot be performed in the garage is necessary every endeavor is made to make the vehicle serviceable until this can be done. A considerable stock of parts and material is carried and from this practically everything that is needed may be requisitioned. In the event of a battery or motor requiring work that cannot be completed in a night a substitution is made when the vehicle is under contract guaranteed

Bailey Electric Roadster

Especially Designed for ELECTRIC LIGHT AND POWER COMPANIES



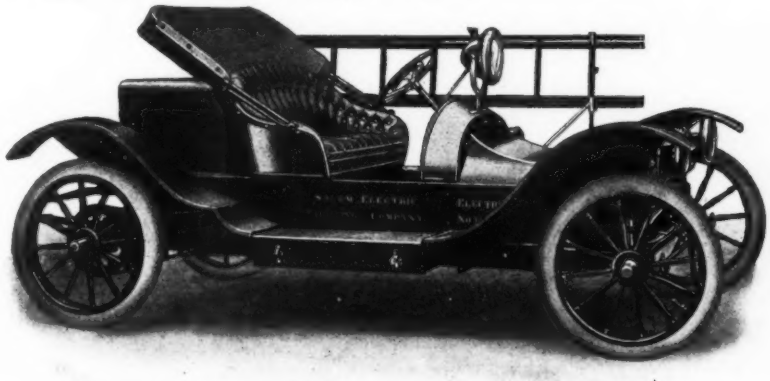
FAST RUNABOUT

Has covered 100 miles of State Road up and down hill in less than 5 hours, one charge of battery.

WATCH THIS LIST GROW

The following are electric light companies which have placed orders up to date:—

EDISON ELECTRIC ILLUMINATING CO., of Boston (19)
MALDEN ELECTRIC CO., Malden, Mass. (3)
COMMONWEALTH EDISON CO., Chicago (2)
BLACKSTONE VALLEY GAS & ELECTRIC CO., Pawtucket, R. I. (2)
SCHENECTADY ILLUMINATING CO., Schenectady, N. Y. (2)
HAVERHILL ELECTRIC CO., Haverhill, Mass.
FRANKLIN ELECTRIC LIGHT CO., Turners Falls, Mass.
MINNEAPOLIS GENERAL ELECTRIC CO., Minneapolis, Minn.
OMAHA ELECTRIC LIGHT & POWER CO., Omaha, Neb.
STAMFORD GAS & ELECTRIC CO., Stamford, Conn.
SALEM ELECTRIC LIGHTING CO., Salem, Mass.
MONTREAL LIGHT, HEAT & POWER CO., Montreal.
CONCORD MUNICIPAL LIGHT PLANT, Concord, Mass.
LYNN GAS & ELECTRIC LIGHT CO., Lynn, Mass.
CAMBRIDGE ELECTRIC LIGHT CO., Cambridge, Mass.
NEW BEDFORD GAS & EDISON LIGHT CO., New Bedford, Mass.
HARRISBURG LIGHT & POWER CO., Harrisburg, Pa.
EDISON ELECTRIC ILLUMINATING CO., of Brockton, Mass.
COMMONWEALTH WATER & LIGHT CO., Summit, N. J.
CONSUMERS ELECTRIC LIGHT & POWER CO., New Orleans, La.
SUBURBAN GAS & ELECTRIC CO., Revere, Mass.
COSMOPOLITAN ELECTRIC CO., Chicago, Ill.



LIGHT SERVICE WAGON.

The large box back of the seat serves to carry arc lamp globes, carbons, etc., and on the inside is 32 inches long, 23¼ inches wide and 16⅞ inches high. Felt lined compartments to suit.

Each running board box measures inside 35 inches long, 12 inches wide and 5¼ inches high.

S. R. Bailey & Co., Inc., 895 Boylston St., Boston

Factory at Amesbury, Mass.

G-1-500

Electric Garage—30 S. Eutaw St.

Daily Repair & Charging Instruction Sheet.

Date ____ 19____

Wagon No.	Repairs To Be Made	Noted By	Charging Instructions	Noted By
			Signed.	

Daily Repair and Instruction Sheet, Ruled for 22 Entries, in Black on White Paper, 10.5 Inches Length and Eight Inches Width.

attention, or for the accommodation of a regular customer, so that there need be no delay in service that can possibly be avoided. The company's machines are all worked days, as are the vehicles of other customers, save the American Express Company, which uses one or two nights and some a part of the night, so that the greater part of the work is done between 6 in the evening and 7 in the morning, and Sundays. The busiest day of the week is Sunday, for the inactivity of the wagons affords opportunity for going over them and making examinations and changes of equipment that time might not allow at night or on working days.

A 3.5-ton G. V. truck has been fitted as an emergency machine and this is equipped with a winch, tools, tackle and whatever experience has taught may be needed, and this is used by the company for its own work as well as for bringing in machines that may have become disabled. This truck is to be equipped with a crane so that labor may be minimized and it will be possible to handle wheels, batteries, motors and other heavy parts should there be occasion to make changes outside of the garage.

The "Daily Charge Report" is made up so that a single sheet may be made to cover the service for six vehicles for a single day, or for one vehicle for six days, and note is made of 24 successive hours from noon, so that the report may be made at any time with reference to voltmeter and ammeter readings, and for a specified vehicle from a stated charging plug. This report shows the condition of the battery at the completion of the charge with relation to gas, temperature and specific gravity, and the wattmeter readings at start and finish. This report is signed by the battery man and submitted to the office. The daily report is sent to the customer and the information is noted in a monthly report compiled for the use of the garage office. When a work outside of the contract requirements is received a "Repair Tag" is made out and on this is noted the size, location and number of the wagon, and the number of the requisition that is made for the part or material used. This tag is attached to the vehicle and the claim check made a part of the tag is detached and given the owner or driver, the check merely serving to identify the wagon through the number of it corresponding with the numerals on the main part of the tag. This tag is used as well for repair work on batteries, etc., and it is utilized as a means of identification between the office and the shop.

DRIVER'S REPORT.

Wagon No.____ Date____ 191 .

Time Out____ Time In____

Odometer A. M.____ P. M.____

Report on Condition of Car ____

Signed____

Driver's Report, on Card Five by Three Inches, Ruled for 10 Lines and a Heading.

C. G. E. L. & P. CO. OF BALTO Daily Charge Report Date beginning

Car No. Plug No. V.	A.	Car No. Plug No. V	A.	Car No. Plug No. V	A.	Car No. Plug No. V	A.	Car No. Plug No. V	A.	Car No. Plug No. V	A.
12 M											
1 P M											
11											
12 NT											
1 A M											
10											
11											
Gas at end of chg.											
Temp. do											
Gravity do											
Wattmeter-Finish											
" Start											

Signed____ Battery Man.

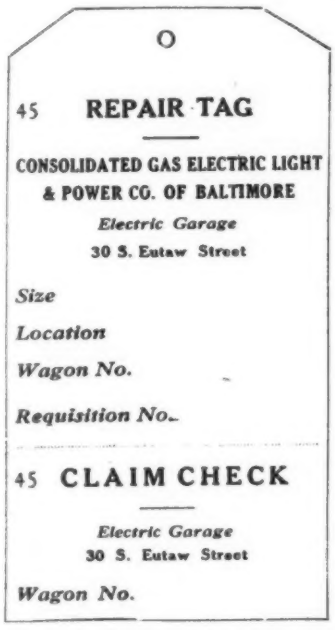
Daily Charging Report, in Black on White Paper, 13 Inches Length and Eight Inches Width, Padded.

In the event of supplies of any character being required by the garage that may be obtained through the company a "Store Order" is made out and submitted to the storekeeper at any specific locality and this becomes a requisition and a voucher for a charge against the garage department. This is a form that is used throughout the accounting system of the company. As filled out a statement is given of the use, to be made of the material or supply and the order it is to be used with and the account to which the charge is to be made, where it is to be delivered and the signature of the authority for the order.

The memorandum of a requisition made upon the stock room of the garage gives a serial number, the date, the job number, the name and the address of the person for whom the work is being performed, and besides specifying the quantity itemizes the material.

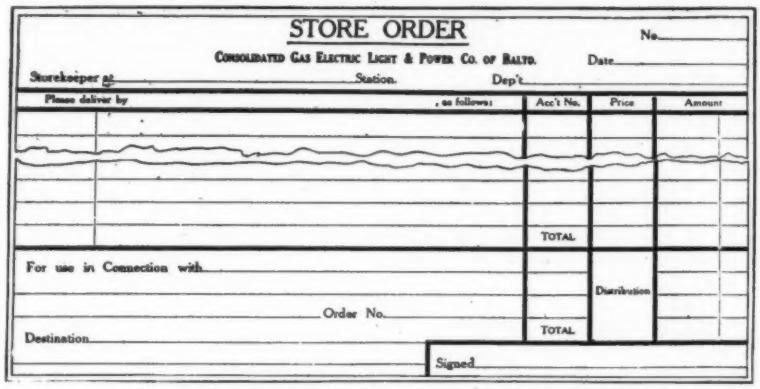
A carbon copy is made that is retained in the stock room, and the original is sent to the office. A "Store Credit" is filled in when material is returned unused or is recovered in a condition to be utilized, and this specifies the material, the quantity and the price, as well as the account to which credit is given. This is another uniform blank of the company.

What is known as a "Store Stock Ledger" is kept in card index form, this being utilized to maintain an inventory as well as a statement of stock received. This gives the catalog number, the name of the manufacturer, the name, the date, the requisition number, the quantity, the price separately and in stated quantity, the section of the stock room, the bin number and the maximum and the minimum quantity permitted. The entries are of the requisition number, by whom received, the date, the number issued and the balance remaining in stock. The card will permit of 120 entries.



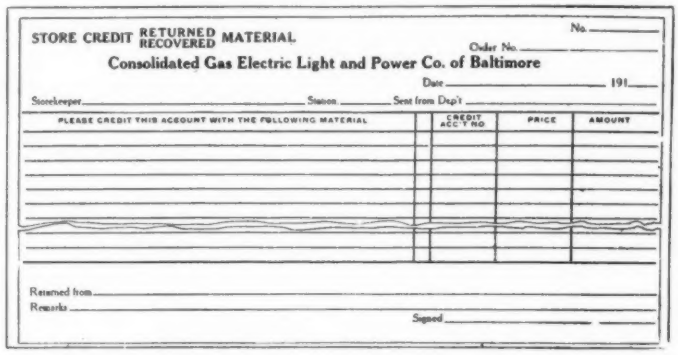
Repair Tag, Manila Paper, Eight Inches Length and 3.75 Inches Width, Perforated for Check Two Inches Length.

In connection with the work performed for the company a "Work Order" is issued, the order being in duplicate and bearing a serial number. This order is utilized for work performed in the garage as well as by the vehicles or for labor in other departments. This gives the date, the location of the work, its connection if any with other work, and the number of the account to which it is to be charged. This is indorsed with the date of completion, the name of the person performing the work, and is signed by the person having the supervision, in the case of the garage this being the manager or the foreman. The original is filed with the record of the job and the copy is sent to the office, this being the data for accounting.



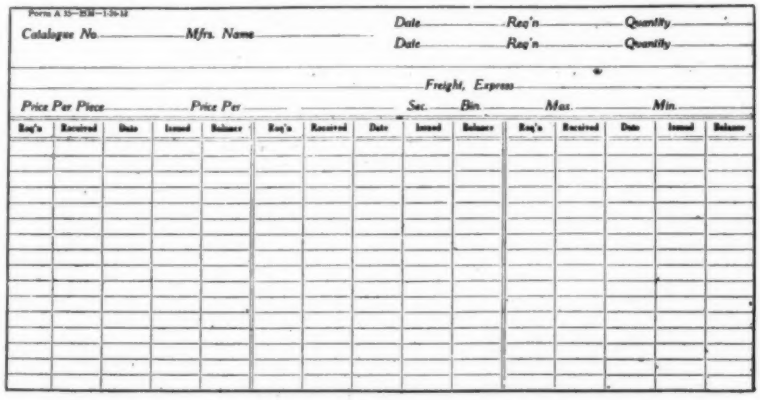
Store Order, in Black on White Paper, Five Inches Length and Eight Inches Width, Padded.

The time report also deals with the time of the workmen on repair work of any character, as well as serving as a record for the other departments of the company, this covering the service of the wagons. This gives the name of the department to which the pay roll is to be charged, the rate of pay of the man and wagon, the name of the check number, wagon number, the order number, the location and description of the work, the account, the time of starting and completing the work, the number of hours and the charge for labor and vehicles separately itemized and totalled. The record is attested as correct and is approved, with remarks if the occasion justifies.



Store Credit, in Red on Yellow Paper, Five Inches Length and Eight Inches Width, Padded.

The "Receiving Sheet" that records the receipt of material for the garage is another of the general forms utilized for the garage, and this shows the quantity and the material, the requisition number, the date, from whom re-



Stock Room Ledger, a Card Five Inches Length and Eight Inches Width, Printed in Black on White, Both Sides Kept in Files.

CONSOLIDATED GAS ELECTRIC LIGHT & POWER CO. OF BALTIMORE No. W ORIGINAL 7736

WORK ORDER Date 191

Location

In connection with Charge account No.

COMPLETED 191 BY Signed

Work Order, Five Inches Length and Eight Inches Width, in Black on White and Pink Sheets, the Former Being the Original and the Latter the Copy, and Differentiated by "Original" and "Duplicate" Above the Serial Number.

ceived, the name of the receiving clerk, by whom the stock was entered and remarks. This is made in duplicate and the original is kept on file and the copy is sent to the office. Requisitions are made upon the purchasing department on a standard form, these being in duplicate, the copies being retained in the office.

A form of individual battery record is now in preparation, which will show the exact work performed with each battery, the number of charges, the number of discharges, the mileage, the dates of examination and work, the dates of equalization, the condition at differing dates, and the cost of labor and material. This is expected to give exact data of each battery and the cost for each mile of service.

The "Tire Record" is kept in card index form, the tires being classified as to size, the cards showing the number of the wagons on which these sizes are used. The data include the make, the date received, the position on the vehicle, the date placed on the wheel, the date removed, the mileage, the number of day's service and remarks.

Monthly reports of the garage are divided to cover vehicles used by the electric department of the company, by the gas department of the company, and by customers of the garage, which is made up to include in parallel columns the number of the vehicle assigned by the company or the customer, the number of the maker of the vehicles for which the garage is agent, the vehicle capacity, the department using the vehicles, the period of service between stated dates, the number of hours in service, the total number of miles, the current as represented by kilowatt-hours, and remarks relative to the machines worthy to note. The footings of the hours of service, miles and kilowatt-hours are given, which represent the entire work, miles traversed and current consumed by the machines stored and maintained at the garage. A glance at the form will show its usefulness. This report is compiled from the daily records and is submitted to the office for the purpose of giving briefly the work accomplished by each vehicle. The possibilities for comparison are especially beneficial.

The occurrence sheet is a report made by a driver of any happening in which he or his vehicle, or both, are involved, which has to do with damage or injury to person or property, and it may be summarized as a letter of

REPORT OF ELECTRIC GARAGE
30 South Eutaw Street
Month of December, 1912

CAR NO.	G V No.	Capacity	Used by	Dates	Hours in Service	Miles	KWH	Remarks
Vehicles Used by Gas Department								
Vehicles Used by Customers								
Total Hours in Service								
Miles								
KWH								

American Express Company's Numbers Are Numbers Assigned by That Company

Approved Signed

Monthly Summary of Current Consumption and Mileage for Each Wagon, on Sheet 10.5 Inches Width and 12 Inches Length.

Rate

CONSOLIDATED GAS ELECTRIC LIGHT & POWER CO OF BALTIMORE

Time report of Roll Dept. Date Man

Name Check No Wagon No. Team

Order No.	Location of work	Description of work	Account	Time Started	Time Stopped	Hours	Amount Labor	Amount Teams

Correct Approved Total

Remarks

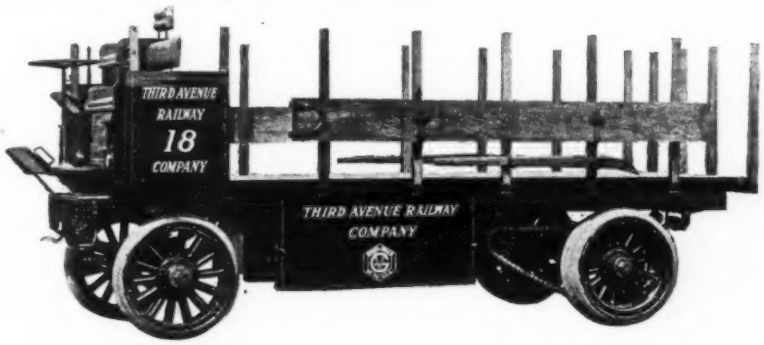
Time Report, Six Inches Length and Nine Inches Width, in Black on Pink Paper, Printed Both Sides and Padded.

29 More G. V. Electric Trucks
FOR THE
New York Railways Company

The Third Avenue Railway Company received their first G. V. Emergency Wagon in May, 1911. Today they have in all, eight G. V. Trucks.

The "Metropolitan" (The N. Y. Railways Company, Successor) bought their first G. V. Truck in November, 1911. On March 25, 1913, they placed their entire order for new electric truck equipment with the General Vehicle Company, Inc.

The new order calls for 29 machines: Three 1,000 lb. Wagons; one 2,000 lb. Money Wagon; Five 2-ton Emergency Wagons; 14 3½-ton Trucks, with steel dumping bodies. Four 3½-ton and two 5-ton Trucks, with stake and platform bodies.



This gives them in all 30 G. V. Electrics, representing an investment of over $100,000.

Over 100 other public service corporations including some in Manila and in Rio de Janeiro, use G. V. Electrics and many of these are standardizing on the G. V. product. They can safely do so for money can buy no better.

We can offer you **transportation machinery** proven by 12 years use. Catalogue 85 on request.

General Vehicle Company, Inc.

General Office and Factory

LONG ISLAND CITY, N. Y.

NEW YORK **CHICAGO** **BOSTON** **PHILADELPHIA**

G 5921

Consolidated Gas Electric Light & Power Co.
OF BALTIMORE
. . . CHARGE . . .

Job _____ *Date,* _____ *191*__

Name _____

Address _____

Quantity			

Mechanic _____

Stock Room Receipt to Accompany Material Requisitioned, in Black on Yellow Paper, 8.5 Inches Length and 6.5 Inches Width.

Consolidated Gas Electric Light and Power Company of Baltimore

MATERIAL received at _____ *STOREROOM*

Req'n No. _____ *Date* _____ *191*__

RECEIVED of _____

Bags *Cartons*
Barrels *Coils*
Boxes *Crates*
Bundles *Reels* *VIA* _____ *CHARGES* _____

WEIGHT GAS METER, and No. WAY-BILL

QUANTITY	MATERIAL

REMARKS

Receiving Clerk _____

Entered by _____

Receiving Sheet, 8.6 Inches Length and Width, in Black on Alternate White and Yellow Sheets, to be Entered in Duplicate, and Perforated for Loose Leaf Binding.

record, which is taken as a basis for inquiry or investigation in the event of either being necessary. These sheets are submitted by the garage manager to the manager of the commercial department. They are kept in the file form for reference.

The "Chamber of Horrors" is unique in that it is a large board or tablet on which are permanently displayed such parts of machines as may have been damaged or have failed through neglect, carelessness, incompetency or any other cause within the control of the driver or garage men, and with each is a card describing the cause and how the employees might have prevented the damage and loss of time and expense. It is the belief of the management that this exhibition has a decided value and serves a distinct purpose, as it demonstrates the consequences that may be prevented by the exercise of common sense, and indicates the responsibilities of the man as established by the company.

Another interesting means of educating the drivers is the "paving map" of Baltimore, which is a map showing the streets of the city and indicating which are paved, so that it is possible for the drivers for the company and for customers to select the route that should be best to economize time and minimize wear on the vehicles. This map is carefully revised and kept up to date. It is possible through its use to avoid poor paving and streets on which the surfaces have deteriorated, and to choose the highways where the paving is at the Baltimore standard or the surfaces are good. This has been found especially useful in haulage in sections not familiar to the men.

Tire Record **Size 3** **Wagon No.**

Make	Date Reset	Put on Veh.	Date on Veh.	Date off Veh.	Mileage	No. Days Service	Remarks

Tire Record, Three Inches Length and Five Inches Width, on Card Perforated for Filing.

The insurance record is a standard form used by the company with reference to insuring all its property, and this is an application to the treasurer of the company to secure protection on the garage and its equipment or the vehicles, and when filled it provides the description necessary for the application for the insurance and for incorporation in the policy.

In the garage office are kept the records which are sent to the accounting department of the company, and these are supplied daily or monthly as may be required. The garage itself is known to the auditor as the subject of "Account No. 300," and in accounting this deals with the operation of the agency for vehicles and the operation of the electric garage. The explanation of the account is as follows:

This account is intended to show the cost of operating the electric garage, 30 South Eutaw Street, and the electric vehicles owned and maintained by the company, also to show the income derived from the operation of the garage and vehicles and sale of vehicles and should be sub-divided as follows:

(A) Garage Expense—To be charged with all labor, material, electric current and other expenses of operating and maintaining the electric garage at 30 South Eutaw Street, and the charging station at Monument Street, storeroom or elsewhere, including the rental of the garage building at 30 South Eutaw Street, excluding the maintenance, repairs or depreciation of vehicles.

(B) Vehicle Expense—To be charged with all labor, material and expense for maintenance and repairs of the electric vehicles in connection with work done at the garage at 30 South Eutaw Street, including replacement of tires or other parts of vehicles.

(C) Vehicle Fixed Charges—To be charged with allowance for interest, depreciation and insurance on electric vehicles owned and operated by the company.

(D) Selling Expense—To be charged with any soliciting or selling expenses in connection with the sale of electric vehicles, including the pay of the drivers for demonstrating purposes and including the per diem charged for any vehicles used for selling or demonstrating purposes.

(E) Garage Income—To be credited with the amount of all charges made to customers, including this company, for care of battery and vehicle storage, washing, oiling and inspection, according to schedule of rates fixed for such service, to be found in the company's selling programme.

(F) Garage Repair Income—To be credited with the amount of all charges made to customers, including this company, for maintenance and repairs of electric vehicles, including replacement of tires and other parts of vehicles to be covered by repair and maintenance charges issued by the garage.

(G) Vehicle Rent—To be credited with the balance remaining in the per diem against departments for the use of electric vehicles after crediting Gar-

This Trade Mark The Guarantee of Excellence on Goods Electrical.

The Central Station's Most Profitable Business

The 100,000 Electric Automobiles

In one large city electric vehicle charging yields the greatest return per service connection—from eleven to four times that from the lighting of flats. To get your share of this business from the hundred thousand electric automobiles in use and to build up the use of electric vehicles by the merchants in your city you should push only the most dependable electric automobile equipment.

A Size for Every Need

G-E Automobile Motors assure a maximum continuity of service far excelling that of horse or gasoline vehicles and an ever ample hill-climbing power which robs mud, snow and ice of their power. Actual records by many merchants prove this even where the cars are operated by men who can neither read nor write and who have received but a few minutes' instruction on the operation of the vehicles.

Electric vehicles equipped with G-E motors and G-E continuous torque controllers are a valuable traveling advertisement for your power. G-E electrical equipment embodies every principle of design and skillful manufacture which has made motors made by the General Electric Company preeminent in electric haulage today.

Our automobile equipment engineers are the pioneer designers of automobile motors and controllers. They will promptly advise you on any drive problem you may encounter.

General Electric Company

List of Sales Offices on Second Page Before Editorial Section

3627

The Trade Mark of the Largest Electrical Manufacturer in The World.

age Income and Garage Repair Income, thus balancing sub-accounts (A), (B) and (C).

(H) Income from Sales—Will be credited with any profit made on the sale of electric vehicles.

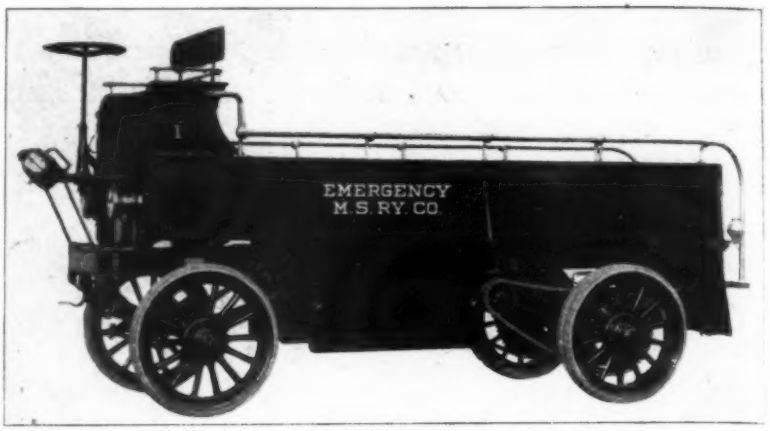
It is further explained: That it is understood that all electric vehicles owned by the company are to be subject to a per diem charge representing the full cost of the vehicles which will be made up of an allowance for interest, depreciation, insurance, the charge for garage service, storage, washing, oiling and inspection according to the company's schedule for such charges, and the charge for electric current according to the company's schedule of charges. This per diem, together with the cost of maintenance and repairs, as such cost may accrue, is to be charged against the department for such days as the vehicles may be used. The cost of driver for vehicles is not handled through this account. This is an operating account under the heading of "General Expense, Electric."

In making up the per diem charge it was found that the cost of operating the vehicles did not greatly vary, and after a considerable experience in determining a price that might be applied to each type of vehicle it was decided that it would be best to make a uniform charge of 35 cents an hour for machines up to and including 2,000 pounds capacity, and 70 cents an hour for machines of more than 2,000 pounds capacity, and these prices are now charged against the departments.

G. V. Gets Big Truck Order from New York Railways Company.

The General Vehicle Company, Long Island City, N. Y., has secured a fine order from the New York Railways Company for the following equipment:

One 1,000-pound wagon with express type body; two 1,000-pound wagons with panel bodies; one 2,000-pound panel money wagon; 14 7,000-pound trucks with steel dumping bodies with hand operated dumping devices; four 3.5-ton trucks with platform and stake bodies; one five-ton truck with platform and stack body; one five-ton special truck.



Type of G. V. Emergency Electric Truck Ordered by New York Railways Company.

Electric Vehicles in Southern California.

J. Harry Pieper, engineer of illumination and vehicles of the Southern California, Edison Company, in an interesting article entitled "Electric Vehicles," in the March, 1913, issue of *Edison Current Topics*, published by the company, gives the following information regarding electric vehicles in Southern California.

"There were 635 electric vehicles registered in California from September 1, 1911, to September 1, 1912. In the year from January 1, 1912 to the present time there have been approximately 300 electric vehicles registered in Southern California. Of these 200 are being charged off our lines, and as most of these machines are charged between 10 o'clock at night and six o'clock in the morning, a time when our lines are least loaded, you can easily realize what desirable business this is. There are eight electric trucks now in use in this city independent of the ones owned and operated by this company, and they are all being charged with Edison "juice." The Broadway Department Store is installing an electric wagon, and if it works as satisfactorily as it is expected it will, it means the installation of 23 wagons. The American Express Company has two two-ton trucks now in operation here with two more to follow. Wells Fargo & Company have ordered 76 vehicles, and I have been given to understand that four of them are to be assigned to this city.

"It has been necessary for us to work along educational lines in our efforts to promote the general use of electric vehicles, and, as is well known, working along educational lines must necessarily be slow, yet we feel that inasmuch as the conditions here for the use of electric vehicles are ideal, we can in time surmount all obstacles and have a representative showing of electric trucks—one that we may be proud of.

"The electrification of our city merchandise transportation systems now presents a consumer of great possibilities. Commercial conditions are now requiring a more rapid transfer of merchandise, and in the large cities the congestion of merchandise is becoming a serious problem. The electrical system applied to trucks offers advantages over the gasoline in many respects. The electric motors being more simple in construction, are more durable and efficient, have been improved and

Type of G. V. Electric Tower Wagon Ordered by New York Railways Company.

Books on Electric Vehicles

The Automobile Hand-Book

By L. ELLIOTT BROOKES, Assisted by Other Well-Known Experts

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The automobile hand book is a work of practical information for the use of owners, operators and automobile mechanics, giving full and concise information on all questions relating to the construction, care and operation of gasoline and electric automobiles, including road troubles, motor troubles, carbureter troubles, ignition troubles, battery troubles, clutch troubles, starting troubles. With numerous tables, useful rules and formulas, wiring diagrams and over 320 illustrations.

Power transmission is thoroughly discussed, and the various systems of transmitting the power from the motor to the driving axle are analyzed and compared.

The perusal of this work for a few minutes when troubles occur, will often not only save time, money, and worry, but give greater confidence in the car, with regard to its going qualities on the road, when properly and intelligently cared for.

This is a brand new book from cover to cover—1911 Edition—and must not be confounded with any former editions of this popular work.

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The various theories and problems involved in the construction and operation of the prevailing types of motor road carriages have been stated as clearly as possible, in order that the involved situations may be readily comprehended by all readers. The fundamental principles of the several types of motor, particularly of the gasoline engine, which is the least understood of all, have been treated at considerable length, in order that the facts may be thoroughly comprehended in their new relations.

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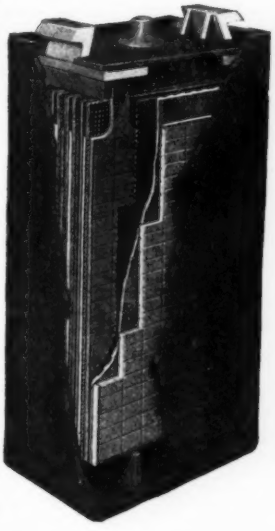
CHICAGO

Why Long Battery Life and High Capacity are Best Combined in the GOULD Storage Battery.



Constant jarring from rough roads makes simple rugged construction essential in any electric vehicle battery, yet in most batteries high capacity per charge is obtained at the expense of long life by using a *soft paste* composition in the positive plates. It is only reasonable that in a *soft* mass the particles of oxide come loose and become worthless quicker, thus making frequent plate renewals necessary to maintain the initial capacity.

Right here is where the Gould Storage Battery gained its pre-eminence, through the substitution of a *hard* for the *soft* composition, the former being applied by an exclusive process that greatly prolongs the life of the plate and at the same time gives an initial capacity equal to that of the soft composition, and a freedom from serious deterioration that keeps subsequent capacity far in advance of that from the softer composition. In other words, every particle of the active material in the Gould Battery plate does maximum useful work before dislodging.

You can obtain this advantage *only in Gould Batteries.* That the hard plate is powerful and long lived, is highly desirable and profitable can be confirmed by asking any Gould Storage Battery user, or we will cite plenty of actual performance records if you tell us your battery requirements.

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69

Detroit Electrics, Made by Anderson Electric Car Company, for Houston Electric Light & Power Company.

batteries have been improved and their efficiency greatly increased in the last few years.

"The size of the motor and number of cells in batteries limit the speed of an electric truck, which acts as a check on reckless driving and insures slower and more uniform speed and results in a lower maintenance cost.

"The successful introduction and wide use of these vehicles depends upon the education of the public in their proper application and care.

"An educational campaign and some expert assistance is needed so that the vehicle used may be adapted to the purpose and service demanded of them.

"One by one the obstacles that have been in the way of commercial vehicle installations have been overcome, and now the road seems clear; some red blood has been injected into the local situation, a public electric garage that will be equipped to charge all sizes and types of electrics, and three of the manufacturers of electric trucks who manufacture commercial vehicles exclusively, are coming here with agencies and wagons for demonstrations, prepared to make a killing. We are with them from the drop of the hat, and expect that 1913 will prove a banner year for us on the electric vehicle business."

Houston, Texas, Gets Anderson Electrics.

The Houston Electric Light & Power Company of Houston, Tex., has purchased a fleet of electric vehicles from the Anderson Electric Car Company of Detroit. The shipment which has just gone south consists of four cars, three trucks and one roadster. Two trucks are equipped with express bodies and driver's tops. These have been especially designed for inspection and construction service. The third truck is equipped with a panel body and will be used by the meter installation department.

The roadster is for the personal use of the general manager. This car will be employed also in general inspection of the company's service.

The commercial vehicle department of the Anderson Electric Car Company is making rapid strides that compare favorably with their well established position in the pleasure car field.

Early Waverley Electrics.

In May, 1898, Columbia, Riker, Barrows and Waverley electric vehicles were exhibited at an electrical show at Madison Square Garden, New York. In May, 1899, a similar show was held in New York at which Woods, Columbia and Waverley electrics were exhibited. The illustration herewith shows the Waverley exhibit of that year. The cars exhibited were one Stanhope, four dos-a-dos and one delivery wagon, showing that the Waverley factory was at that time manufacturing cars in considerable quantities and for a variety of needs.

The delivery wagon exhibited at this show was sold and delivered to H. A. Meldrum, of Buffalo, the Stanhope to Augustus A. Post, New York, one of the dos-a-dos was delivered in New York, one sent to Putnam, Conn., one to Philadelphia, and one to Lincolnshire, England.

This show held for four weeks beginning May 5, 1899, and the salesmen in the photograph are R. M. Barwise, Robert Hassler and F. M. Hobblett.

In the early winter of 1900, the first exclusive automobile show was held in Madison Square Garden, New York City, by the Automobile Club of America. This has been followed by regular exhibits since that date.

The first electric car built at the Waverley factory, then known as the Indiana Bicycle Company, in Indianapolis, was delivered to Charles Finlay Smith in January, 1897. This was of the Stanhope design with 36-inch wheels and single-tube tire, large herringbone gears, four-pole motor, and a battery designed by Mr. Porter, later of the Porter Battery Company.

These early years in the electric industry were noteworthy for the variety of models of electric cars and the wide distribution of these unusual types. Of the Waverley Stanhope body shown in the photograph about 200 were built; some 50 of the dos-a-dos type of cars with wire wheels and seats arranged like a jaunting car were built and shipped to various parts of the world.

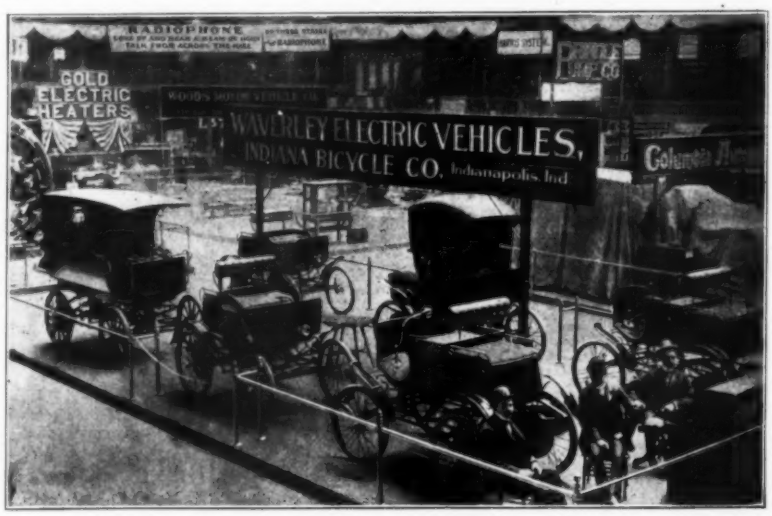
Among the other old-type models were cars known as mail phaetons, Newport brakes, four, eight and nine-passenger brakes, demi-coaches, surreys, tonneaus, station wagons. The cars on which the Waverley Company had the largest run in its early days were an open piano-box runabout and a small type of open road wagon, of which two models in the neighborhood of 2,000 cars were built and sold.

As early as 1903 three of these cars were equiped with Edison batteries, and another in 1906. These were of the experimental Edison type put out by the inventor long before the present successful Edison battery was put on the market.

Five Waverley Electrics for Parcels Post.

Postmaster-General Hitchcock signalized his last day in office by the purchase of five Waverley 1,000-pound delivery wagons for service in the parcel post.

A 600-pound Waverley delivery wagon has been in the service of the parcel post in Indianapolis for some months and has given such satisfaction that it undoubtedly led to the order from Washington.



An Exhibit of Waverley Electrics, New York Electrical Show, May, 1899.